Escondido Union High School District

Manufacturing 1

EUHSD Board Approval Date: 2/14/17
The EUHSD Manufacturing 1 curriculum document identifies what students should be able to know by grade level in a comprehensive standards-based course of study. The curriculum document is updated annually based on student academic achievement data, research and best practices, and input from stakeholders. The EUHSD curriculum document contains the following documents and/or information:

A. Course Description
B. Course Guidelines/Requirements - graduation credit information, transcript information, adopted materials, adopted technology, assessment outline
C. Instructional Materials References
D. Scope and Sequence Map with Essential Standards outlined by Unit
E. References to key essential design and implementation documents

A comprehensive course of study and/or program is designed so that all students have access to the rigorous curriculum necessary to graduate high school demonstrating college and career readiness skills. Student-Centered learning provides opportunity for collaboration, communication, and a robust learning environment and provides opportunities for all students to meet the goals of the district’s Instructional Focus at the time of this writing: “All students communicate their thinking, ideas and understanding by effectively using oral, written and/or non-verbal expression.”

A key design consideration in the transition to the new California State Standards is a focus on changes to pedagogy. The English Language Arts instructional shifts guide classroom teaching and learning and the foundation of curriculum and instructional design. Key considerations of the ELA Instructional shifts can be found by visiting the following URL: http://www.corestandards.org/other-resources/key-shifts-in-english-language-arts/

The curriculum document is aligned to the California Model Career Technical Education Standards and reflects learning outcomes from both the anchor and pathway standards.
Manufacturing 1 allows students to continue to learn about and engage in the skills and activities related to the Manufacturing and Product Development Career Pathway. In Manufacturing 1, students continue to explore a variety of manufacturing processes; they deepen their understanding and skills through a variety of hands-on experiences with a variety of industry related tools and develop new skills and competencies related to manufacturing. As in the previous course, students design, create, present, and evaluate their own work and the work of their classmates. Students will continue to work on joining and fastening materials through welding, the use of polymers and other bonding agents, and engage in the collaborative and leadership activities related to these tasks. As in the previous course, students must take and pass a safety test in order to utilize classroom tools and participate in a lab-based classroom setting. This course continues to make connections between students and local manufacturers and includes activities such as hearing from guest speakers and the use of a variety of hands-on, industry related networking opportunities in order to expose students to the various careers within the industry.

### Course Requirements

<table>
<thead>
<tr>
<th>Course Length: Year Long</th>
<th>Grade Level: 9-12</th>
</tr>
</thead>
<tbody>
<tr>
<td>UC/CSU Requirement:</td>
<td>Meets UC/CSU “g” requirement</td>
</tr>
<tr>
<td>Course Number (Semester A):</td>
<td>6443</td>
</tr>
<tr>
<td>Course Number (Semester B):</td>
<td>6444</td>
</tr>
<tr>
<td>Credits (Semester A): 5 Elective or CTE</td>
<td>Credits (Semester B): 5 Elective or CTE</td>
</tr>
<tr>
<td>Required Prerequisite/s:</td>
<td>None</td>
</tr>
<tr>
<td>Industry Sector: Manufacturing and Product Development</td>
<td>Career Pathway: Machining and Forming Technologies</td>
</tr>
<tr>
<td>Board Approval Date (Curriculum): 2/14/17</td>
<td>Board Approval Date (Materials):</td>
</tr>
<tr>
<td>Core Instructional Material/s:</td>
<td>Supplemental Instructional Material/s:</td>
</tr>
<tr>
<td><strong>Precision Machining Technology</strong> by Hoffman, et. al., NIMS Press 2012 (Class Set)</td>
<td><strong>Machinery’s Handbook</strong>, Industrial Press, Inc.; 30th edition (March 1, 2016), ISBN: 978-0-83-113091-6 (1 per teacher)</td>
</tr>
<tr>
<td>Technology Resource/s: Teachers will utilize a variety of equipment in the work/lab space.</td>
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<tr>
<td><strong>Occasional access to a Computer Lab</strong></td>
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<tr>
<td>Assessment/s: The course is designed as a project based curriculum. Each unit outlines specific skills and/or long term projects which serve as unit and course assessments.</td>
<td></td>
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</tbody>
</table>
Scope and Sequence Guide

The Scope and Sequence Guide is a California standards based document that delineates the standards based skills students are expected to know and do in order to meet College and Career Readiness expectations. Each unit of study in the Scope and Sequence document is designed to build upon the previous unit and/or prerequisite coursework in support of student mastery of specific standards based skills. The Scope and Sequence document provides the framework of understanding for key assignments, key assessments, and instructional resources and strategies that serve to assist students in meeting unit learning objectives. The document will be updated annually with input from all stakeholders.

In coursework requiring reading and writing, the following standards are not specifically stated in any one unit of study, but are the result of implementation throughout the curriculum as students participate in reading, writing, and speaking/listening standards based activities.

- By the end of grade 11, students will read and comprehend literary nonfiction in the grades 11-CCR text completely and proficiently, with scaffolding as needed at the high range. (Reading Informational Text Standard 10)
- Students will write routinely over extending time frames (time for research, reflection, and revision) and shorter time frames (a single sitting or a day or two) for a range of tasks and purposes. (Writing Standard 10)
- “To be college and career ready, students must have ample opportunities to take part in a variety of rich and structured conversations – as part of a whole class, in small groups, and with a partner – build around important content in various domains. They must be able to contribute appropriately to conversations, make comparisons and contrasts, and analyze and synthesize a multitude of ideas according to the standards of evidence appropriate to a particular discipline.” (Standards for ELA Anchor Standards for Speaking/Listening)

The following CTE anchor standards are not specifically stated in any one unit of study, but are reflected as skills and practices throughout the curriculum.

- MPD Anchor 4.0 Technology Use existing and emerging technology, to investigate, research, and produce products and services, including new information, as required in the Manufacturing and Product Development sector workplace environment. (Direct alignment with WS 11-12.6)
- MPD Anchor 6.0 Health and Safety: Demonstrate health and safety procedures, regulations, and personal health practices and determine the meaning of symbols, key terms, and domain-specific words and phrases as related to the Manufacturing and Product Development sector workplace environment. (Direct alignment with RSTS 9-10, 11-12.4)
- MPD Anchor 10.0 Technical Knowledge and Skills: Apply essential technical knowledge and skills common to all pathways in the Manufacturing and Product Development sector, following procedures when carrying out experiments or performing technical tasks. (Direct alignment with WS 11-12.6)
- MPD Anchor 11.0 Demonstration and Application: Demonstrate and apply the knowledge and skills contained in the Manufacturing and Product Development anchor standards, pathway standards, and performance indicators in classroom, laboratory, and workplace settings, and through the Skills USA career technical student organizations.
# Manufacturing 1 Scope and Sequence

## Unit 1 – Workshop Safety

**Length:** 6 Weeks

### Unit Description:
In Unit 1, students will participate in hands-on activities designed to build their foundational understanding of participation in a workshop classroom environment. Students will examine specific safety and use policies, procedures, and practices. Students will examine work spaces for safety and/or health concerns. They will be expected to demonstrate a variety of safety practices through various classroom assignments and activities and will demonstrate their understanding through completion of a required safety test. Many of the skills and procedures acquired in Unit 1 will be built upon in subsequent units of study.

### Unit Standards:

#### Manufacturing and Product Development Anchor Standards:

6.1 Locate, and adhere to, Material Safety Data Sheet (MSDS) instructions.

6.2 Interpret policies, procedures, and regulations for the workplace environment, including employer and employee responsibilities.

6.3 Use health and safety practices for storing, cleaning, and maintaining tools, equipment, and supplies.

6.4 Set up a work area, or shop, to avoid potential health concerns and safety hazards including but not limited to ergonomics, electrical (shock), wires (tripping), fumes (lung health), noise (hearing loss), fire (burns), and so forth, incorporating ergonomics.

6.5 Practice personal safety when lifting, bending, or moving equipment and supplies.

6.6 Demonstrate how to prevent and respond to work-related accidents or injuries and emergencies.

6.7 Maintain a safe and healthful working environment.

6.8 Be informed of laws/acts pertaining to the Occupational Safety and Health Administration (OSHA).

### Learning Objectives:

**Students will be able to…**

- Explain what a Material Safety Data Sheet is, where to access it, and how to apply its information to enhance personal safety.
- Use a workshop protocol document to know what they are responsible for in the workshop.
- Properly store, clean and maintain tools, equipment and supplies.
- Safely set up their work areas to avoid health hazards and injuries.
- Demonstrate safe and proper techniques when moving equipment and supplies.
- Demonstrate how to prevent and respond to work-related accidents or injuries and emergencies.
- Maintain a safe and healthful work environment.
- Recall 2-3 OSHA laws which pertain to worker safety.

### Unit Assignments:

- Students will work in groups of 2-3 to create a poster diagramming and outlining key components of workshop safety. Students will present their posters to two other groups, and groups will evaluate one another’s posters and presentation quality.
- Students will take a multiple choice safety test and pass the test with 90% accuracy prior to utilizing equipment and/or working in the shop area. All wrong questions will be written out with the correct answers, and will contain reasoning as to why the correct answer is appropriate.
- Students will develop a housekeeping/clean-up plan for each shop based on photographs and videos of the workshops as they appear during actual work. The plan will be in a spreadsheet format, identifying potential hazards and ways to mitigate those hazards so they do not result in injuries.

### Unit Assessments:

- Written safety test with 100% correct responses
- Hands on performance assessment of basic equipment
### Meeting the Needs of ELs:

- Utilize the student information system to acquire the language levels of EUHSD English Learners.
- In 2012, the CA Department of Education adopted new language level proficiency descriptors and new EL state standards. Visit the following website to learn more about those new descriptors and corresponding standards: [http://www.cde.ca.gov/sp/el/er/documents/eldstndspublication14.pdf](http://www.cde.ca.gov/sp/el/er/documents/eldstndspublication14.pdf)
- In 2014, the CA Department of Education adopted new ELA-ELD Framework, with specific strategies designed to meet the needs of EL students. Visit the following URL to learn more about the new frameworks: [http://www.cde.ca.gov/ci/rl/cf/documents/elasdfwchapter11.pdf](http://www.cde.ca.gov/ci/rl/cf/documents/elasdfwchapter11.pdf)

### Instructional Resources:

- *Precision Machining Technology* Unit 1
- [www.osha.gov](http://www.osha.gov)
- [www.youtube.com](http://www.youtube.com)
- Safety Manual

### Instructional Strategies:

- Teacher led Lecture
- Video demonstrations
- Group work and/or pair work
- Differentiate vocabulary or use of glossary
- Teacher led demonstrations on all equipment prior to safety tests
- Use of instructional notebooks
Manufacturing 1 Scope and Sequence
Unit 2 – Materials and Measurement
Length: 6 Weeks

Unit Description: In Unit 2, students will be introduced to many new vocabulary terms in the area of technical drawing. They will apply the terminology and processes to drawing by interpreting technical drawings and performing precision measurements, enabling them to select appropriate project parameters. Students will participate in a variety of hands-on assessments that are designed to demonstrate understanding of basic measurements and how they apply to design principles.

Unit Standards:

Manufacturing and Product Development Pathway Standards:
B1.0 Validate that a provided part meets specifications from its engineering drawing by comparing specifications (geometric dimensioning and tolerancing) and by demonstrating proper technique using appropriate precision measuring tools.
B1.1 Identify and describe how the isometric and the orthographic views and the tolerance, scale, and material from an engineering drawing are used with an actual part.
B1.2 Demonstrate the correct use of precision measuring tools such as vernier and dial calipers, height gages, and micrometers utilizing both English and Metric systems.
B1.3 Demonstrate the correct use of a gage block (set) to check a part or to calibrate the accuracy of other precision measuring tools.
B3.0 Research and compare the properties of two metals using two different material specifications and a process specification.
B3.1 Classify the difference between ferrous and nonferrous metals and contrast low-, medium-, and high-carbon steels by their common uses in industry.
B3.2 Describe both the alloys from their classification systems utilizing Unified Numbering System (UNS) or American Iron and Steel Institute-Society of Automotive Engineers (AISI-SAE) and explain how characteristics such as the Rockwell Hardness Test affect machining operations.
B3.3 Demonstrate how to calculate, then revise the calculations, for spindle speed and feed rate, for both alloy examples, for either a vertical mill or a lathe.

Learning Objectives:

Students will be able to...
• Interpret technical drawings by locating dimensions and tolerances.
• Create isometric and orthographic drawings from a representative object.
• Use measuring tools to verify conformance of parts according to technical drawings.
• Use the Machinery’s Handbook or other appropriate reference materials to determine a metal’s properties.
• State the common applications for which various types of metals are chosen.
• Explain how characteristics such as the Rockwell Hardness Test affect machining operations.
• Calculate spindle speeds and feed rates for the vertical mill and lathe.

Unit Assignments:
• Students will work individually and, at times, in pairs to create orthographic and isometric sketches using a real-life object. They will utilize industry requirements in order to evaluate the accuracy of their drawings. Assignments will be uploaded and/or hand created assignments will be placed into the student’s work portfolio for review.
• Students will complete a series of measurement tests designed to assess their understanding and mastery of basic measurements utilized throughout the course. This may be either a hands on and/or paper demonstration of understanding (fraction, inch, decimal inch, dial caliper, micrometer, etc.).
• Students will be required to complete a process planning worksheet for all projects including cutting speeds based on material hardness, feed rates, and RPMs.
• Inspect all projects and complete an inspection report to indicate the degree of accuracy of the part(s).
• All students will complete a required end of unit exam on drawing views and interpretations, RPM and feed calculations.

Unit Assessments:
• Measurement Tests
• Materials and Measurement Unit Exam
• Ongoing performance assessments (direct observation within the workshops) by the teacher.
### Meeting the Needs of ELs:

- Utilize the student information system to acquire the language levels of EUHSD English Learners.
- In 2012, the CA Department of Education adopted new language level proficiency descriptors and new EL state standards. Visit the following website to learn more about those new descriptors and corresponding standards: [http://www.cde.ca.gov/sp/el/er/documents/eldstdspublication14.pdf](http://www.cde.ca.gov/sp/el/er/documents/eldstdspublication14.pdf)
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### Instructional Resources:

- Precision Machining Technology Section 2
- [www.youtube.com](http://www.youtube.com)
- Basic Technical Drawing, Chapters 2, 6, & 9

### Instructional Strategies:

- Teacher led Lecture
- Video demonstrations
- Group work and/or pair work
- Differentiate vocabulary or use of glossary
- Teacher led demonstrations on all equipment prior to safety tests
- Use of instructional notebooks
**Unit Description:** In Unit 3, students will be able to understand engineering drawings, perform layout using hand tools, and use hand tools and power saws to perform secondary operations on a work piece after cutting it to size.

**Unit Standards:**

<table>
<thead>
<tr>
<th>Manufacturing and Product Development Pathway Standards:</th>
</tr>
</thead>
<tbody>
<tr>
<td>B2.1 Describe and then contrast when to use work-holding fixtures, such as v-block, angle plate, toe clamp, vises, chucks, or custom fixtures.</td>
</tr>
<tr>
<td>B2.4 Use a surface plate, surface gage, height gage, prick and center punches, scriber, layout dye, and other appropriate tools to locate hole centers, radii, and locations matching the specifications provided.</td>
</tr>
<tr>
<td>B4.1 Using a length of bar stock and a process specification or drawing, cut a length of bar stock matching the cut list and demonstrate no sharp edges.</td>
</tr>
<tr>
<td>B4.2 Cut one steel bar and one aluminum plate determining the correct or optimal blade material (carbon steel, high speed, or bimetal), the proper sawtooth set to use for each, and explain why.</td>
</tr>
<tr>
<td>B5.1 Discuss and demonstrate the wide variety of metal cutting hand files: materials, sizes, shapes, cuts, and tooth configurations.</td>
</tr>
<tr>
<td>B5.2 Describe and demonstrate the care and use of the common file which can be used to form radii on a variety of commercially available metals or those that have been casted or forged.</td>
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<tr>
<td>B5.9 Complete a layout project using a detailed set of sequential instructions to manufacture the project to plan specifications.</td>
</tr>
<tr>
<td>B7.3 Drill, tap, or ream holes according to specifications.</td>
</tr>
<tr>
<td>B7.4 Research the proper material machinability and tooling recommendations from trade resources such as ‘Machinery’s Handbook’; choose the correct tool and holder; and calculate the spindle rpm and the feed rate for holes.</td>
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<tr>
<td>B7.5 Perform secondary operations on each hole to specification including: reaming, countersinking, counter boring, tapping, and deburring.</td>
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</tbody>
</table>

**Learning Objectives:**

- Students will be able to use various tools to layout hole centers, radii, and locations matching the specifications provided.
- Accurately layout all the features found on the NIMS Benchwork project (Job Duty 2.1) and on the NIMS Layout project (Job Duty 2.2).
- Safely cut a length of bar stock matching according to a cut list and demonstrate no sharp edges.
- Use various metal cutting hand files varying in materials, sizes, shapes, cuts, and tooth configurations.
- Properly care for metalworking files.
- Drill, tap, and ream holes according to specifications.
- Perform secondary operations on each hole to specification including: reaming, countersinking, counter boring, tapping, and deburring.
- Use a pin gage or thread gage to validate each hole or that a tapped thread meets specifications.

**Unit Assignments:**

- Students will become knowledgeable about the various layout and hand tools used in manufacturing by completing Machine Parts Matching worksheets.
- Students will complete the Layout Calculation Worksheet in order to accurately create layout lines on their Layout and Benchwork Projects.
- Students will create a Process Planning Worksheet for all projects which includes the order of operations, necessary tooling, and applicable machining speeds and feed rates.
- Students will learn to use a *Machinery’s Handbook* by completing a Text Walk and Scavenger Hunt assignment.

**Unit Assessments:**

- Layout and Hand Tools knowledge tests
- NIMS Layout Project (evaluated/graded by student then teacher)
- NIMS Benchwork Block (evaluated/graded by student then teacher)
- Drilled, Countersinked, and Tapped Holes (evaluated/graded by student then teacher)
- Ongoing performance assessments (direct observation within the workshops) by the teacher
- Job Planning, Layout, and Benchwork Unit Exam
B7.6 Use a pin gage or thread gage to validate each hole or that a tapped thread meets specifications.

<table>
<thead>
<tr>
<th>Meeting the Needs of ELs:</th>
<th>Instructional Resources:</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Utilize the student information system to acquire the language levels of EUHSD English Learners.</td>
<td>• <em>Precision Machining Technology</em>, Section 3.</td>
</tr>
<tr>
<td>• In 2012, the CA Department of Education adopted new language level proficiency descriptors and new EL state standards. Visit the following website to learn more about those new descriptors and corresponding standards: <a href="http://www.cde.ca.gov/sp/el/er/documents/eldstndspublication14.pdf">http://www.cde.ca.gov/sp/el/er/documents/eldstndspublication14.pdf</a></td>
<td>• <em>Machinery’s Handbook</em></td>
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<td>• In 2014, the CA Department of Education adopted new ELA-ELD Framework, with specific strategies designed to meet the needs of EL students. Visit the following URL to learn more about the new frameworks: <a href="http://www.cde.ca.gov/ci/rl/cf/documents/elaeldfwchapter11.pdf">http://www.cde.ca.gov/ci/rl/cf/documents/elaeldfwchapter11.pdf</a></td>
<td>• <a href="http://www.youtube.com">www.youtube.com</a></td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Instructional Strategies:</th>
</tr>
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<tbody>
<tr>
<td>• Teacher led Lecture</td>
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<tr>
<td>• Video demonstrations</td>
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<td>• Group work and/or pair work</td>
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<td>• Differentiate vocabulary or use of glossary</td>
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<tr>
<td>• Teacher led demonstrations on all equipment prior to safety tests</td>
</tr>
<tr>
<td>• Use of instructional notebooks</td>
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</tbody>
</table>
## Manufacturing 1 Scope and Sequence
### Unit 4 – Drill Press
#### Length: 6 Weeks

**Unit Description:** In Unit 4, after receiving an overview of various metalworking and machine tools, students will be trained in the safe operation of each machine and through written, verbal and demonstration methods, demonstrate/list procedures for each of those tools. Students will use these tools in support of completing the major projects for the Manufacturing 1 course. In this unit, students will utilize the drill press to complete a drill gauge block after completing precision layout of all features to be created in the block.

### Unit Standards:

#### Manufacturing and Product Development

**Pathway Standards:**
- B2.4 Use a surface plate, surface gage, height gage, prick and center punches, scriber, layout dye, and other appropriate tools to locate hole centers, radii, and locations matching the specifications provided.
- B7.1 Set up and safely operate a drill press.
- B7.3 Drill, tap, or ream holes according to specifications.
- B7.4 Research the proper material machinability and tooling recommendations from trade resources such as ‘Machinery’s Handbook’; choose the correct tool and holder; and calculate the spindle rpm and the feed rate for holes.
- B7.5 Perform secondary operations on each hole to specification including: reaming, countersinking, counter boring, tapping, and deburring.
- B7.6 Use a pin gage or thread gage to validate each hole or that a tapped thread meets specifications.

#### Learning Objectives:
- **Students will be able to…**
  - Explain the major parts and functions of a twist drill bit.
  - Set up and use various toolholding and workholding devices on the drill press.
  - Set up and safely operate a drill press.
  - Calculate the appropriate RPM for a given workpiece.
  - Perform drill press operations such as drilling, reaming, countersinking, counter boring, tapping, and deburring.

#### Unit Assignments:
- Students will become knowledgeable about the working parts of the drill press by completing a Machine Parts Matching worksheet.
- Students will create a Process Planning Worksheet for the Drill Press Block project which includes the order of operations, necessary tooling, and applicable machining speeds and feed rates.
- Students will complete Workbook Section 4, Unit 2 questions entitled Tools, Tool Holding, and Workholding for the Drill Press in order to familiarize them with the various tools used on the drill press.
- Students will be guided through the peer-to-peer Drill Press set-up and Drilling Observation check list so they will be able to evaluate one another.
- Students will cut out raw stock, perform deburring operations, layout dimension and feature lines, machine away excess metal to produce parts to specific dimensions which are with tolerance, and perform finishing techniques to produce complete parts.
- Students will perform quality assurance measurements and inspections to ensure that their projects are made to specification in order to evaluate their own, as well as their peers'.

#### Unit Assessments:
- Drill Press safety test
- Drill Press Set-Up and Drilling Observation check-list
- Basic Drill Press Block
- NIMS Drill Press Block (Job Duty 2.8)
- Drill Press Unit Exam
Meeting the Needs of ELs:

- Utilize the student information system to acquire the language levels of EUHSD English Learners.
- In 2012, the CA Department of Education adopted new language level proficiency descriptors and new EL state standards. Visit the following website to learn more about those new descriptors and corresponding standards: [http://www.cde.ca.gov/sp/el/er/documents/eldstndspubli](http://www.cde.ca.gov/sp/el/er/documents/eldstndspublication14.pdf)
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Instructional Resources:

- *Precision Machining Technology*, Section 4: "Drill Press"
- *Machinery’s Handbook*
- [www.youtube.com](http://www.youtube.com)

Instructional Strategies:

- Teacher led Lecture
- Video demonstrations
- Group work and/or pair work
- Differentiate vocabulary or use of glossary
- Teacher led demonstrations on all equipment prior to safety tests
- Use of instructional notebooks
## Manufacturing 1 Scope and Sequence
### Unit 5 - Turning
**Length:** 6 Weeks

**Unit Description:** In Unit 5, after receiving proper safety instruction and passing an industry-approved safety test, students will gain experience in basic and intermediate operations on the Engine Lathe. Students will use these skills to create a measured spindle with various features which will evolve into a hand tool by the end of the course.

<table>
<thead>
<tr>
<th><strong>Unit Standards:</strong></th>
<th><strong>Learning Objectives:</strong></th>
<th><strong>Unit Assignments:</strong></th>
<th><strong>Unit Assessments:</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Manufacturing and Product Development</strong></td>
<td><strong>Students will be able to...</strong></td>
<td><strong>Students will become knowledgeable about the working parts on the engine lathe by completing a Machine Parts Matching worksheet and reviewing the parts with their peers.</strong></td>
<td><strong>Lathe Safety Test</strong></td>
</tr>
<tr>
<td><strong>Pathway Standards:</strong></td>
<td></td>
<td><strong>Students will create a Process Planning Worksheet for all projects on the lathe which will include the order of operations, necessary tooling, and applicable machining speeds and feed rates.</strong></td>
<td><strong>Basic Lathe Spindle Project containing knurled section.</strong></td>
</tr>
</tbody>
</table>
| B2.5 Describe and demonstrate the engine lathe by grinding a high speed tool bit focusing on the tool cutting geometry and tip radius, speeds and feeds for the materials being cut and using their tool bit and precision measuring tool, machine a part within specifications. | - Properly form a HSS (high speed steel) cutting tool for the lathe by using a pedestal grinder.  
- Turn (cut) a part on the lathe to dimensional specifications.  
- Select cutting tools for the lathe based on the type of material to be cut.  
- Set the proper RPM and cutting speed for any given material.  
- Set up and safely operate an engine lathe taper attachment.  
- Produce various parts according to the specifications provided on blueprints/drawings. | **Students will set up and safely operate an engine lathe taper attachment.**  
**Students will produce various parts according to the specifications provided on blueprints/drawings.** | **Shoulder Bushing Project according to a shop blueprint** |
| B3.3 Demonstrate how to calculate, then revise the calculations, for spindle speed and feed rate, for both alloy examples, for either a vertical mill or a lathe. |  | **Students will guide through the peer-to-peer Lathe set-up and Turning Observation check list so they will be able to evaluate one another.** | **Game Peg Project** |
| B5.3 Describe and demonstrate cold forming (i.e. knurling on a lathe). |  | **Students will work collaboratively to produce several projects of varying difficulty using the engine lathe.** | **Plumb Bob Project** |
| B7.6 Use a pin gage or thread gage to validate each hole or that a tapped thread meets specifications. |  | **Students will cut out raw stock, perform deburring operations, layout dimension and feature lines, machine away excess metal to produce parts to specific dimensions which are with tolerance, and perform finishing techniques to produce complete parts.** | **Lathe Unit Exam** |
| B8.0 Describe and demonstrate the machining of an external and internal taper, knurled part, and threaded and bored part on an engine lathe to plan specification or drawing to produce a part and measure each end diameter within tolerance. |  | **Students will perform quality assurance measurements and inspections to ensure that their projects are made to specification in order to evaluate their own, as well as their peers'.** |  |
| B8.1 Demonstrate proper cutting tool selection and speeds for an engine lathe. |  |  |  |
| B8.2 Set up and safely operate an engine lathe taper attachment or turning center. |  |  |  |
| B8.3 Produce a shoulder-bushing to the specification of the drawing provided. |  |  |  |
### Meeting the Needs of ELs:
- Utilize the student information system to acquire the language levels of EUHSD English Learners.
- In 2012, the CA Department of Education adopted new language level proficiency descriptors and new EL state standards. Visit the following website to learn more about those new descriptors and corresponding standards: [http://www.cde.ca.gov/sp/el/er/documents/eldstndspublication14.pdf](http://www.cde.ca.gov/sp/el/er/documents/eldstndspublication14.pdf)
- In 2014, the CA Department of Education adopted new ELA-ELD Framework, with specific strategies designed to meet the needs of EL students. Visit the following URL to learn more about the new frameworks: [http://www.cde.ca.gov/ci/rl/cf/documents/elaeldfwchapter11.pdf](http://www.cde.ca.gov/ci/rl/cf/documents/elaeldfwchapter11.pdf)

### Instructional Resources:
- *Precision Machining Technology*: Section 5: "Turning"
- *Machinery’s Handbook*
- *www.youtube.com*

### Instructional Strategies:
- Teacher led Lecture
- Video demonstrations
- Group work and/or pair work
- Differentiate vocabulary or use of glossary
- Teacher led demonstrations on all equipment prior to safety tests
- Use of instructional notebooks
# Manufacturing 1 Scope and Sequence

## Unit 6 - Milling

**Length:** 6 Weeks

**Unit Description:** In Unit 6, Students will become knowledgeable about the working parts on the vertical mill press. Students will perform quality assurance measurements and inspections using the vertical mill press to assure project quality.

<table>
<thead>
<tr>
<th>Unit Standards:</th>
<th>Learning Objectives:</th>
<th>Unit Assignments:</th>
<th>Unit Assessments:</th>
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</thead>
<tbody>
<tr>
<td><strong>Manufacturing and Product Development</strong>&lt;br&gt;<strong>Pathway Standards:</strong>&lt;br&gt;B2.2 Describe and demonstrate how to indicate a vice on a milling machine to “square up” a block on a mill using a micrometer and a precision square measure to confirm that the block is square.&lt;br&gt;B2.4 Use a surface plate, surface gage, height gage, prick and center punches, scriber, layout dye, and other appropriate tools to locate hole centers, radii, and locations matching the specifications provided.&lt;br&gt;B3.3 Demonstrate how to calculate, then revise the calculations, for spindle speed and feed rate, for both alloy examples, for either a vertical mill or a lathe.&lt;br&gt;B7.4 Square-up and lay out a block according to provided drawing and/or specifications.&lt;br&gt;B7.6 Use a pin gage or thread gage to validate each hole or that a tapped thread meets specifications.&lt;br&gt;B9.1 Set up and safely operate a vertical milling machine.&lt;br&gt;B9.2 Demonstrate proper cutting tool selection and speeds and demonstrate an efficient setup to minimize work-holding setups.</td>
<td><strong>Students will be able to...</strong>&lt;br&gt;• Select cutting tools for the vertical milling machine based on the type of material to be cut.&lt;br&gt;• Set the proper RPM and cutting speed for any given material.&lt;br&gt;• Set up and safely operate the vertical milling machine.&lt;br&gt;• Produce various parts according to the specifications provided on blueprints/drawings.</td>
<td><strong>Students will become knowledgeable about the working parts on the vertical mill by completing a Machine Parts Matching worksheet.</strong>&lt;br&gt;<strong>Students will create a Process Planning Worksheet for all projects which includes the order of operations, necessary tooling, and applicable machining speeds and feed rates.</strong>&lt;br&gt;<strong>Students will complete Workbook Section 6, Units 2&amp;3 questions entitled Tools, Tool Holding, and Workholding for the Vertical Milling Machine and Vertical Milling Machine Operations in order to familiarize them with the various tools used on the Vertical Milling Machine.</strong>&lt;br&gt;<strong>Students will be guided through the peer-to-peer Vertical Mill set-up and Milling Observation check list so they will be able to evaluate one another.</strong>&lt;br&gt;<strong>Students will cut out raw stock, perform deburring operations, layout dimension and feature lines, machine away excess metal to produce parts to specific dimensions which are with tolerance, and perform finishing techniques to produce complete parts.</strong>&lt;br&gt;<strong>Students will perform quality assurance measurements and inspections to ensure that their projects are made to specification in order to evaluate their own, as well as their peers’.</strong></td>
<td><strong>Vertical Mill Safety Test</strong>&lt;br&gt;<strong>Square Up A Block Project</strong>&lt;br&gt;<strong>Bottle Opener Project</strong>&lt;br&gt;<strong>NIMS Milling Block</strong>&lt;br&gt;<strong>Vertical Mill Unit Exam</strong></td>
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</tbody>
</table>

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### Meeting the Needs of ELs:

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### Instructional Resources:

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