Spokane Public Schools
Manufacturing Foundations (Woods)

Course: Manufacturing Foundations (Woods)		**Total Framework Hours up to: 540 Hours**
CIP Code: 140102	☒**Exploratory** ☐**Preparatory**	**Date Last Modified: 5/6/15**
Career Cluster: Manufacturing		**Cluster Pathway: Manufacturing Production Process Development**

COMPONENTS AND ASSESSMENTS

Performance Assessments:

Model safe practices and meet all safety requirements to work in the lab environment
Participate in teams to continuously improve safety in the learning environment
Work as a team member to maintain a safe and efficient classroom and identify focus for continuous improvement projects (5S Audits)
Participate in continuous improvement project planning and execution including present and future state documentation (kaizen projects) (TL)
Locate, interpret, and apply MSDS information, when asked by instructor, e.g., a site evaluation/inspection as occurs in industry

Leadership Alignment:

- Apply Technology Effectively
- Be Flexible
- Work Effectively in Diverse Teams
- Be Responsible to Others

Classroom Focus:

- Computer/Technology Ethics

Community Focus:

- Examine and discuss technology rules and guidelines

Standards and Competencies

Standard/Unit: C-1 Safety and Teamwork

Competencies		**Total Learning Hours for Unit: 80 Hours**
C-1.1 TL	Understand importance of working in a team environment	
C-1.2 TL	Understand etiquette of working in a team environment	
C-1.3	Understand business and personal ethics	
C-1.4	Understand responsibilities of employee to employer and vice-versa	
C-1.5 TL	Aware of indicators and methods to prevent discrimination, harassment, and promote equality in the work environment	
C-1.6 TL	Understand methods and concepts of problem solving	
A-1.7 TL	Demonstrate team and leadership skills	
C-1.8	Understand the structure of typical manufacturing organizations.	
C-1.9 TL	Understand interactions, advantages, and promote a diverse work force	
C-1.10 TL	Discuss importance of organizational integration in manufacturing a product	

C-1.11	Understand responsibilities of line and staff organizations
C-1.12	Understand electronic communications in linking manufacturing processes
A-1.13 TL	Able to facilitate group meetings
C-1.14	Follow all established safety practices in the lab
C-1.15 TL	Understand and apply 5S concepts to maintain a safe, efficient learning environment
C-1.16	Know and apply safe practices with hand tools
C-1.17	Know and apply safe practices with power tools
C-1.18 TL	Knows 5S and applies sustaining practices
C-1.19 TL	Recognizes and uses visual systems
A-1.20 TL	Applies 5S audits and documents progress
A-1.21 TL	Proficient in root cause analysis and 5-why's.
A-1.22 TL	Leads and designs projects to improve and develop visual management tools
C-1.23	Demonstrates understanding and applies proper use of PPE
C-1.24	Know the location and application of MSDS records
A-1.25 TL	Audit MSDS sheets and know how to locate and update MSDS documents
A-1.26 TL	Design and implement error/injury prevention (poke yoke) strategies

Aligned Washington State Standards

Arts		
Educational Technology	EALR 1.1.1	Innovate: Demonstrate creative thinking, construct knowledge and develop innovative products and processes using technology
	EALR 1.1.2	Collaborate: Use digital media and environments to communicate and work collaboratively to support individual learning and contribute to the learning of others
	EALR 1.1.3	Investigate and Think critically: Research, manage, and evaluate information and solve problems using digital tools and resources
	EALR 2.2.1	Practice Safety: Practice safe, legal, and ethical behavior in the use of information and technology
	EALR 2.2.2	Operate Systems: Understand technology systems and use hardware and networks to support learning
	EALR 2.2.3	Select and Use Applications: Use productivity tools and common applications effectively and constructively
	EALR 2.2.4	Adapt to Change (Technology Fluency): Transfer current knowledge to new and emerging technologies
Health and Fitness		
Language		
Math	MP.2	Reason abstractly and quantitatively.
Reading	RST 9-12.1	Cite specific textual evidence to support analysis of science and technical texts, attending to important distinctions the author makes and to any gaps or inconsistencies in the account.
	RST 9-12.2	Determine the central ideas or conclusions of a text; summarize complex concepts, processes, or information presented in a text by paraphrasing them in simpler but still accurate terms.
	RST 9-12.3	Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks; analyze the specific results based on explanations in the text.
	RST 9-12.4	Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 11–12 texts and topics.
	RST 9-12.5	Analyze how the text structures information or ideas into categories or hierarchies, demonstrating understanding of the information or ideas.
	RST 9-12.6	Analyze the author's purpose in providing an explanation, describing a procedure, or discussing an experiment in a text, identifying important issues that remain unresolved.

	RST 9-12.7	Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g., quantitative data, video, multimedia) in order to address a question or solve a problem.
	RST 9-12.8	Evaluate the hypotheses, data, analysis, and conclusions in a science or technical text, verifying the data when possible and corroborating or challenging conclusions with other sources of information.
	RST 9-12.9	Synthesize information from a range of sources (e.g., texts, experiments, simulations) into a coherent understanding of a process, phenomenon, or concept, resolving conflicting information when possible.
Science	HS-ETS1-2	Design a solution to a complex real-world problem by breaking it down into smaller, more manageable problems that can be solved through engineering
	HS-ETS1-3	Evaluate a solution to a complex real-world problem based on prioritized criteria and trade-offs that account for a range of constraints, including cost, safety, reliability, and aesthetics as well as possible social, cultural, and environmental impacts
	HS-ETS1-4	Use a computer simulation to model the impact of proposed solutions to a complex real-world problem with numerous criteria and constraints on interactions within and between systems relevant to the problem
	HS-LS2-7	Design, evaluate, and refine a solution for reducing the impacts of human activities on the environment and biodiversity
	HS-ESS3-4	Evaluate or refine a technological solution that reduces impacts of human activities on natural systems
Social Studies		
Speaking and Listening	SL.11-12.5	Make strategic use of digital media (e.g., textual, graphical, audio, visual, and interactive elements) in presentations to enhance understanding of findings, reasoning, and evidence and to add interest.
Writing	WHST 9-12.2	Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes.
	WHST 9-12.7	Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation.
	WHST 9-12.8	Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the strengths and limitations of each source in terms of the specific task, purpose, and audience; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and overreliance on any one source and following a standard format for citation.
	WHST 9-12.9	Draw evidence from informational texts to support analysis, reflection, and research.

COMPONENTS AND ASSESSMENTS
Performance Assessments: Accurately apply math concepts and skills as a tool to make decisions regarding work with material and manufacturing processes
Leadership Alignment: Implement Innovations Reason Effectively Use Systems Thinking Solve Problems Adapt to Change Interact Effectively with Others Work Effectively in Diverse Teams Manage Projects Produce Results Guide and Lead Others

Be Responsible to Others

Classroom Focus:

- Measure and create data tools to define continuous improvement areas to target for implementing innovations
- Measure outcome of classroom maintenance team roles and embed quality assurance and process economics to guide improvement for those functions

Community Focus:

- Measure to define areas for target improvement with community/industry partner
- Use the engineering process to solve a problem and evaluate through documented pre-implementation data

Standards and Competencies

Standard/Unit: C-2 Introduction to Manufacturing Math

Competencies	**Total Learning Hours for Unit: 30 Hours**

C-2.1 Add, subtract, multiply, and divide whole numbers, with and without a calculator
C-2.2 Use a standard ruler and metric ruler to measure.
C-2.3 Add, subtract, multiply, and divide fractions.
C-2.4 Convert decimals to percentages and percentages to decimals.
C-2.5 Recognize and use metric units of length, weight, volume, and temperature.
C-2.6 Recognize some of the basic shapes used in the manufacturing industry, and apply basic geometry to measure them
C-2.7 Convert denominate numbers and solve problems using them
C-2.8 Calculate using rules
C-2.9 Calculate using metric, linear, square, volume, and weight measurements
C-2.10 Calculate the stretch-outs for selected fittings
C-2.11 Construct simple geometric figures.
C-2.12 Apply mathematical formulas to solve problems
C-2.13 Solve problems sequentially with simple equations
C-2.14 Solve linear, area, volume, and angle measurement problems
C-2.15 Solve percentage problems
C-2.16 Define and solve ratio and proportion problems
C-2.17 Use a protractor, a vernier caliper, and a micrometer
C-2.18 Calculate selected seam allowances
C-2.19 Demonstrate competence in solving selected field measuring problems
C-2.20 Apply standard rules and practice for solving selected field measurement problems
C-2.21 Describe common practices used for field measuring and layout of duct runs and fittings
C-2.22 Demonstrate competence in solving selected field measuring problems
C-2.23 Apply standard rules and practices for solving selected field measurement problems
A-2.24 Apply math and technology tools and strategies to determine surface areas and volumes of 3-dimensional products
A-2.25 Apply math and technology tools and strategies to analyze strength to weight considerations in product design
A-2.26 Collect and implement graphs and equations to contrasts variable processes

Aligned Washington State Standards

Arts		
Educational Technology	EALR 1.1.3	Investigate and Think critically: Research, manage, and evaluate information and solve problems using digital tools and resources
Health and Fitness		

Language		
Math	MP.2 MP.4 HSN-Q.A.1 HSN-Q.A.2 HSN-Q.A.3 HSA-SSE.A.1	Reason abstractly and quantitatively. Model with mathematics. 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. Define appropriate quantities for the purpose of descriptive modeling. Choose a level of accuracy appropriate to limitations on measurement when reporting quantities. Interpret expressions that represent a quantity in terms of its context.
Reading	RST 9-12.1 RST 9-12.3 RST 9-12.7	Cite specific textual evidence to support analysis of science and technical texts, attending to important distinctions the author makes and to any gaps or inconsistencies in the account. Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks; analyze the specific results based on explanations in the text. Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g., quantitative data, video, multimedia) in order to address a question or solve a problem.
Science		
Social Studies		
Speaking and Listening	SL.11-12.5	Make strategic use of digital media (e.g., textual, graphical, audio, visual, and interactive elements) in presentations to enhance understanding of findings, reasoning, and evidence and to add interest.
Writing	WHST 9-12.7 WHST 9-12.8	Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation. Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the strengths and limitations of each source in terms of the specific task, purpose, and audience; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and overreliance on any one source and following a standard format for citation.

COMPONENTS AND ASSESSMENTS

Performance Assessments:
Accurately use tools for measurement to produce products within acceptable tolerances

Leadership Alignment:

- Implement Innovations
- Reason Effectively
- Use Systems Thinking
- Solve Problems
- Adapt to Change
- Interact Effectively with Others
- Work Effectively in Diverse Teams
- Manage Projects
- Produce Results
- Guide and Lead Others
- Be Responsible to Others

Classroom Focus:

- Use tools for precision in production process
- Make tools for more efficient and accurate production methods

Community Focus:

- Implement precision with tools for measurement and consistent production

Standards and Competencies

Standard/Unit: C-3 Measurement

Competencies	**Total Learning Hours for Unit: 30 Hours**

C-3.1 Describe measurement's role in manufacturing and production
C-3.2 Identify types of measurement used in manufacturing and production
C-3.3 Understand the importance of calibrating instruments
C-3.4 Select proper tools for measurement
C-3.5 Convert units from one measurement system to another
C-3.6 Lists characteristics of measurement tools
C-3.7 Perform measurements with general and precision tools
C-3.8 Describe common measuring errors and proper techniques
C-3.9 Describe measuring systems

Aligned Washington State Standards

Arts		
Educational Technology		
Health and Fitness		
Language		
Math	MP.2	Reason abstractly and quantitatively.
	MP.4	Model with mathematics.
	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.
	HSN-Q.A.2	Define appropriate quantities for the purpose of descriptive modeling.
	HSN-Q.A.3	Choose a level of accuracy appropriate to limitations on measurement when reporting quantities.
Reading	RST 9-12.1	Cite specific textual evidence to support analysis of science and technical texts, attending to important distinctions the author makes and to any gaps or inconsistencies in the account.
	RST 9-12.3	Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks; analyze the specific results based on explanations in the text.
	RST 9-12.7	Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g., quantitative data, video, multimedia) in order to address a question or solve a problem.
Science		
Social Studies		
Speaking and Listening	SL.11-12.5	Make strategic use of digital media (e.g., textual, graphical, audio, visual, and interactive elements) in presentations to enhance understanding of findings, reasoning, and evidence and to add interest.
Writing	WHST 9-12.7	Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation.

	WHST 9-12.8	Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the strengths and limitations of each source in terms of the specific task, purpose, and audience; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and overreliance on any one source and following a standard format for citation.

COMPONENTS AND ASSESSMENTS

Performance Assessments:

Develop and use tools for error proofing
Design, apply, and improve production systems that embed quality assurance checks and maintenance
Assess production systems for quality assurance and improvement

Leadership Alignment:

Implement Innovations
Reason Effectively
Use Systems Thinking
Solve Problems
Adapt to Change
Work Independently
Be Self-Directed Learners
Interact Effectively with Others
Work Effectively in Diverse Teams
Manage Projects
Produce Results
Guide and Lead Others
Be Responsible to Others

Classroom Focus:

- Pre-engineering – Define continuous improvement areas to target for implementing innovations
- Implement classroom maintenance team roles and embed quality assurance and process economics to those functions

Community Focus:

- Assign areas for target improvement with community/industry partner
- Use the engineering process to solve a problem

Standards and Competencies

Standard/Unit: C-4 Quality Assurance and Process Economics

Competencies		**Total Learning Hours for Unit: 80 Hours**
C-4.1	Define quality in manufacturing	
A-4.2	Understand how quality can improve profit	
C-4.3	Apply principles of continuous quality improvement	
A-4.4 TL	Understand and apply statistical process control	
A-4.5 TL	Evaluate data to monitor production processes	
A-4.6 TL	Analyze consumer problems caused by manufacturing and recommend solutions	
A-4.7 TL	Establish plans and procedures to maintain quality	
C-4.8	Define profit and loss and explain why profit is important	
A-4.9	Discuss impact of customer satisfaction on overhead and reputation	
C-4.10	Understand real and hidden costs of an accident	

C-4.11 TL	Define value added
A-4.12 TL	Understand impact of learning curve on costing and pricing
A-4.13	Name factors to be considered in make or buy decisions
A-4.14	List employee benefits commonly provided by industry
A-4.15	Demonstrate knowledge of computer software applications in manufacturing
A-4.16 TL	Understand how production rates are determined (takt time)
A-4.17 TL	Understand inventory control, material forecasting, and capacity planning
C-4.18	Knowledge of work processing, spreadsheets, databases, statistical, and graphical software
A-4.19	Understand and apply budgeting and master scheduling techniques
A-4.20	Define product and process control and explain the importance of each
A-4.21 TL	Apply statistical techniques to monitor and improve processes
C-4.22 TL	Explain just in time inventory
C-4.23	Explain factors that affect work in progress
A-4.24 TL	Design a flow diagram for producing a product
C-4.25	Define roles of designers and engineers in developing a product
A-4.26 TL	Explain the importance of configuration control
A-4.27	List major factors in process planning
C-4.28	Understand design for manufacturing
A-4.29 TL	Design and implement identification and error proofing strategies (poka yoke) in manufacturing processes

Aligned Washington State Standards

Arts		
Educational Technology	EALR 1.1.1	Innovate: Demonstrate creative thinking, construct knowledge and develop innovative products and processes using technology
	EALR 1.1.2	Collaborate: Use digital media and environments to communicate and work collaboratively to support individual learning and contribute to the learning of others
	EALR 1.1.3	Investigate and Think critically: Research, manage, and evaluate information and solve problems using digital tools and resources
	EALR 2.2.1	Practice Safety: Practice safe, legal, and ethical behavior in the use of information and technology
	EALR 2.2.2	Operate Systems: Understand technology systems and use hardware and networks to support learning
	EALR 2.2.3	Select and Use Applications: Use productivity tools and common applications effectively and constructively
	EALR 2.2.4	Adapt to Change (Technology Fluency): Transfer current knowledge to new and emerging technologies
Health and Fitness		
Language		
Math	MP.2	Reason abstractly and quantitatively.
	MP.4	Model with mathematics.
	HSA-SSE.A.1	Interpret expressions that represent a quantity in terms of its context.
Reading	RST 9-12.3	Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks; analyze the specific results based on explanations in the text.
	RST 9-12.7	Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g., quantitative data, video, multimedia) in order to address a question or solve a problem.
	RST.9-12.1	Cite specific textual evidence to support analysis of science and technical texts, attending to important distinctions the author makes and to any gaps or inconsistencies in the account.
Science	HSN-Q.A.2	Define appropriate quantities for the purpose of descriptive modeling.
	HSN-Q.A.3	Choose a level of accuracy appropriate to limitations on measurement when reporting quantities.

	HS-ETS1-2	Design a solution to a complex real-world problem by breaking it down into smaller, more manageable problems that can be solved through engineering.
	HS-ETS1-3	Evaluate a solution to a complex real-world problem based on prioritized criteria and trade-offs that account for a range of constraints, including cost, safety, reliability, and aesthetics as well as possible social, cultural, and environmental impacts.
	HS-ETS1-4	Use a computer simulation to model the impact of proposed solutions to a complex real-world problem with numerous criteria and constraints on interactions within and between systems relevant to the problem.
Social Studies		
Speaking and Listening	SL.11-12.5	Make strategic use of digital media (e.g., textual, graphical, audio, visual, and interactive elements) in presentations to enhance understanding of findings, reasoning, and evidence and to add interest.
Writing	WHST 9-12.1	Write arguments focused on discipline-specific content.
	WHST 9-12.7	Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation.
	WHST.9-12.8	Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the strengths and limitations of each source in terms of the specific task, purpose, and audience; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and overreliance on any one source and following a standard format for citation.

COMPONENTS AND ASSESSMENTS

Performance Assessments:

Create precise annotated detail in design for accurate production

Accurately read and apply print plans the production process

Given a set of plans, the students will list and define all symbols and annotations. Students will use the appropriate tools/technology necessary to complete the assessment task.

Produce drawings and/or sketches to required appropriate standards as determined by research, mathematical calculations, and/or other design criteria.

Leadership Alignment:

Think Creatively
Work Creatively with Others
Reason Effectively
Make Judgments and Decisions
Communicate Clearly
Collaborate with Others
Access and evaluate information
Use and Manage Information
Interact Effectively with Others
Work Effectively in Diverse Teams

Classroom Focus:

- Manufacturing process/engineering
- Design/Build
- Literacy Development

Community Focus:

- Socratic Seminar
- Whole group or sub group collaborations: Develop a project
- Analyzing and interpreting articles and other relevant pieces of literature

- Case study article with a presentation
- Case study current trend industry
- Group Project – Continuous improvement project in the community / industry. Examples include the following: neighborhood community -- securing high risk properties defined by the SPD, school community -- designing and fabricating efficient storage and distribution products for classrooms, industry – study process and work flow to design and build more efficient and safer work space

Standards and Competencies

Standard/Unit: C-5 Design/Plan Interpretation

Competencies	**Total Learning Hours for Unit: 80 Hours**

C-5.1.1 Interpret notes and dimensions to determine sizes, materials, and other requirements
C-5.1.2 Identify and explain basis items in detailed drawings
C-5.1.3 Identify basic types of drawing and list the purposes of each
C-5.1.4 Interpret drawing elements regarding layout, plan, production, and inspection
C-5.1.5 Read technical drawings and documents to plan a project.
C-5.1.6 Create freehand technical sketches
C-5.1.7 Produce appropriate orthographic, auxiliary and section drawings and/or sketches to standards determined by research, mathematical calculations, and/or other design criteria.
C-5.1.8 Identify and create axonometric drawings
C-5.1.9 Identify and create oblique drawings
C-5.2.1 Identify and create perspective drawings
C-5.2.2 Explain the basic layout of a set of prints as well as the importance of the accompanying job specifications document
C-5.2.3 Recognize and identify basic print terms, abbreviations, line types, symbols and notes
C-5.2.4 Interpret and follow drawing dimensions
C-5.2.5 Determine true measurements from a print using an Architect's scale
C-5.2.4 Read and interpret plan, elevation, section and detail views and schedules
C-5.2.5 Identify, develop and complete material quantity takeoff sheets
A-5.2.6 Discuss how state and/or local code requirements apply to prints

Aligned Washington State Standards

Arts		
Educational Technology	EALR 1.1.2	Collaborate: Use digital media and environments to communicate and work collaboratively to support individual learning and contribute to the learning of others
	EALR 1.1.3	Investigate and Think critically: Research, manage, and evaluate information and solve problems using digital tools and resources
	EALR 2.2.2	Operate Systems: Understand technology systems and use hardware and networks to support learning
	EALR 2.2.3	Select and Use Applications: Use productivity tools and common applications effectively and constructively
	EALR 2.2.4	Adapt to Change (Technology Fluency): Transfer current knowledge to new and emerging technologies
Health and Fitness		
Language		
Math	MP.2	Reason abstractly and quantitatively.
	MP.4	Model with mathematics.
Reading	RST 9-12.1	Cite specific textual evidence to support analysis of science and technical texts, attending to important distinctions the author makes and to any gaps or inconsistencies in the account.

	RST 9-12.2	Determine the central ideas or conclusions of a text; summarize complex concepts, processes, or information presented in a text by paraphrasing them in simpler but still accurate terms.
	RST.9-12.8	Evaluate the hypotheses, data, analysis, and conclusions in a science or technical text, verifying the data when possible and corroborating or challenging conclusions with other sources of information.
	RST 9-12.9	Synthesize information from a range of sources (e.g., texts, experiments, simulations) into a coherent understanding of a process, phenomenon, or concept, resolving conflicting information when possible.
Science	HS-ETS1-4	Use a computer simulation to model the impact of proposed solutions to a complex real-world problem with numerous criteria and constraints on interactions within and between systems relevant to the problem.
	HS-ETS1-3	Evaluate a solution to a complex real-world problem based on prioritized criteria and trade-offs that account for a range of constraints, including cost, safety, reliability, and aesthetics as well as possible social, cultural, and environmental impacts.
Social Studies		
Speaking and Listening	SL.11-12.5	Make strategic use of digital media (e.g., textual, graphical, audio, visual, and interactive elements) in presentations to enhance understanding of findings, reasoning, and evidence and to add interest.
Writing	WHST 9-12.9	Draw evidence from informational texts to support analysis, reflection, and research.

COMPONENTS AND ASSESSMENTS

Performance Assessments:

Properly prepare material for fabrication.
Plan and fabricate products.
Assemble and finish according to specifications.

Leadership Alignment:

Think Creatively
Communicate Clearly
Collaborate with Others
Use and Manage Information
Manage Goals and Time
Work Independently
Be Self-Directed Learners
Interact Effectively with Others
Work Effectively in Diverse Teams
Manage Projects
Produce Results
Guide and Lead Others

Classroom Focus:

- Manufacturing process/engineering
- Literacy development

Community Focus:

- Socratic Seminar
- Analyzing and interpreting articles and other relevant pieces of literature
- Case study article with a presentation
- Group Project – Continuous improvement project in the community / industry. Examples include the following: neighborhood community -- securing high risk properties defined by the SPD, school community -- designing and fabricating efficient storage and distribution products for classrooms, industry – study process and work flow to design and build more efficient and safer work space

Standards and Competencies	
Standard/Unit: C-6 Build/Fabrication: Shop Skills and Material Processes: Wood	
Competencies	**Total Learning Hours for Unit: 150 Hours**
C-6.1.1 Show working knowledge of fundamental shop skills C-6.1.2 Understand how tools and fixtures are used in manufacturing C-6.1.3 Demonstrate use of common machine tools C-6.1.4 Demonstrate basic skills of fabricating, assembling, and testing a product C-6.1.5 Select appropriate tools for layouts and inspection C-6.1.6 Properly layout a project C-6.1.7 Identify and use tools and procedures to form, cut, finish, fasten, and repair C-6.1.8 Set-up, adjust, and maintain a variety of pieces of power equipment C-6.1.9 Make a face, joint edge, rabbet, and taper by using a joiner C-6.2.1 Plane solid stock to given thicknesses using a planer C-6.2.2 Perform a plunge cut and cut an inside curve and bevel cut with a jig saw C-6.2.3 Perform a cross cut, rip cut, miter joint, and dado with a radial arm saw. C-6.2.4 Perform a cross cut, dado, taper, and other specialized operations with a table saw C-6.2.5 Drill a hole to given dimensions with a drill press C-6.2.6 Drill Euro hinge cups according to standard procedures C-6.2.7 Demonstrate techniques to layout a mortise C-6.2.8 Cut a mortise and a relish with a mortise machine C-6.2.9 Summarize techniques needed to layout a tenon C-6.3.1 Demonstrate procedures used to fit checks for heel and toe on tenoner C-6.3.2 Cut a tenon using a tenoner C-6.3.3 Grind sharp edge tools with a grinder C-6.3.4 Demonstrate methods of preparing stock for use with a lathe C-6.3.5 Demonstrate preparation of turning chisels and duplicators C-6.3.6 Demonstrate methods of horizontal boring using a lathe C-6.3.7 Turn spindles on a lathe; match as required C-6.3.8 Demonstrate the ability to set up the guards and hold downs on a shaper C-6.3.9 Make a pattern cut using a shaper C-6.4.1 Identify different types of sanders C-6.4.2 Demonstrate the ability to set fences and stops on a sander as required C-6.4.3 Demonstrate the ability to set up for fitting miter joint when using a sander C-6.4.4 Smooth the surfaces of a variety of materials using a sander. C-6.4.5 Identify and demonstrate the use of table, overhead, panel and Computer Numerically Controlled routers C-6.4.6 Make cuts using an electric miter box saw, including adjusting stops C-6.4.7 Make rip, cross, and miter cuts using a panel saw C-6.4.8 Demonstrate the ability to use a pistol drill safely C-6.4.9 Identify the proper methods of using an oscillating sander C-6.5.1 Demonstrate the ability to use an electric router C-6.5.2 Exercise the safe use of a belt sander C-6.5.3 Demonstrate the ability to safely use a bayonet saw C-6.5.4 Identify the proper methods of using a circular saw C-6.5.5 Exercise the safe use of a biscuit joiner C-6.5.6 Demonstrate the ability to use an electric sander	

C-6.5.7 Explain the uses of wood boring bits
C-6.5.8 Demonstrate methods of correctly using router cutters
C-6.5.9 Develop and use jigs
C-6.6.1 Develop and use push sticks
C-6.6.2 Design and implement sleds
C-6.6.3 Properly adjust and employ guards

Aligned Washington State Standards		
Arts		
Educational Technology	EALR 1.1.1	Innovate: Demonstrate creative thinking, construct knowledge and develop innovative products and processes using technology
	EALR 2.2.1	Practice Safety: Practice safe, legal, and ethical behavior in the use of information and technology
	EALR 2.2.3	Select and Use Applications: Use productivity tools and common applications effectively and constructively
	EALR 2.2.4	Adapt to Change (Technology Fluency): Transfer current knowledge to new and emerging technologies
Health and Fitness		
Language		
Math	MP.2	Reason abstractly and quantitatively.
	MP.4	Model with mathematics.
Reading	RST 9-12.2	Determine the central ideas or conclusions of a text; summarize complex concepts, processes, or information presented in a text by paraphrasing them in simpler but still accurate terms.
	RST 9-12.9	Synthesize information from a range of sources (e.g., texts, experiments, simulations) into a coherent understanding of a process, phenomenon, or concept, resolving conflicting information when possible.
Science	HS-PS1-1	Use the periodic table as a model to predict the relative properties of elements based on the patterns of electrons in the outermost energy level of atoms
	HS-PS1-3	Plan and conduct an investigation to gather evidence to compare the structure of substances at the bulk scale to infer the strength of electrical forces between particles
	HS-PS1-8	Develop models to illustrate the changes in the composition of the nucleus of the atom and the energy released during the processes of fission, fusion, and radioactive decay
	HS-PS2-6	Communicate scientific and technical information about why the molecular-level structure is important in the functioning of designed materials
Social Studies		
Speaking and Listening		
Writing		

COMPONENTS AND ASSESSMENTS

Performance Assessments:
Assess automation as a tool to accomplish manufacturing tasks
Design and construct assembly processes to accomplish tasks

Leadership Alignment:
Collaborate with Others
Community Focus:

- Group Project – Continuous improvement project in the community / industry. Examples include the following: neighborhood community -- securing high risk properties defined by the SPD, school community -- designing and fabricating efficient storage and distribution products for classrooms, industry – study

process and work flow to design and build more efficient and safer work spaces.

Standards and Competencies

Standard/Unit: C-7 Automation in Manufacturing

Competencies	**Total Learning Hours for Unit: 40 Hours**

C-7.1 Consider when automation can be used
C-7.2 Automated manufacturing systems
C-7.3 Sensors and devices used in automated manufacturing systems

Aligned Washington State Standards

Arts		
Educational Technology	EALR 1.1.1	Innovate: Demonstrate creative thinking, construct knowledge and develop innovative products and processes using technology
	EALR 1.1.3	Investigate and Think critically: Research, manage, and evaluate information and solve problems using digital tools and resources
	EALR 2.2.1	Practice Safety: Practice safe, legal, and ethical behavior in the use of information and technology
	EALR 2.2.2	Operate Systems: Understand technology systems and use hardware and networks to support learning
	EALR 2.2.3	Select and Use Applications: Use productivity tools and common applications effectively and constructively
	EALR 2.2.4	Adapt to Change (Technology Fluency): Transfer current knowledge to new and emerging technologies
Health and Fitness		
Language		
Math	MP.2	Reason abstractly and quantitatively.
	MP.4	Model with mathematics.
	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.
	HSN-Q.A.2	Define appropriate quantities for the purpose of descriptive modeling.
Reading	RST 9-12.1	Cite specific textual evidence to support analysis of science and technical texts, attending to important distinctions the author makes and to any gaps or inconsistencies in the account.
	RST 9-12.2	Determine the central ideas or conclusions of a text; summarize complex concepts, processes, or information presented in a text by paraphrasing them in simpler but still accurate terms.
	RST 9-12.9	Synthesize information from a range of sources (e.g., texts, experiments, simulations) into a coherent understanding of a process, phenomenon, or concept, resolving conflicting information when possible.
Science	HS-ETS1-2	Design a solution to a complex real-world problem by breaking it down into smaller, more manageable problems that can be solved through engineering.
Social Studies		
Speaking and Listening	SL.11-12.5	Make strategic use of digital media (e.g., textual, graphical, audio, visual, and interactive elements) in presentations to enhance understanding of findings, reasoning, and evidence and to add interest.
Writing	WHST 9-12.9	Draw evidence from informational texts to support analysis, reflection, and research.
	WHST.9-12.8	Evaluate the hypotheses, data, analysis, and conclusions in a science or technical text, verifying the data when possible and corroborating or challenging conclusions with other sources of information.

COMPONENTS AND ASSESSMENTS
Performance Assessments: Career and college ready portfolio Continuous improvement projects
Leadership Alignment: Think Creatively Work Creatively with Others Implement Innovations Reason Effectively Use Systems Thinking Make Judgments and Decisions Solve Problems Communicate Clearly Collaborate with Others Access and Evaluate Information Use and Manage Information Analyze Media Create Media Products Apply Technology Effectively Adapt to Change Be Flexible Work Independently Be Self-Directed Learners Interact Effectively with Others Work Effectively in Diverse Teams Manage Projects Produce Results Guide and Lead Others Be Responsible to Others Classroom Focus: • Media literacy: examine areas of media Community Focus: • Create a Career and College Readiness media document
Standards and Competencies
Standard/Unit: C-8 Career and College Readiness

Competencies		**Total Learning Hours for Unit: 50 Hours**
C-8.1	Investigate potential careers based on career interest surveys, industry experiences, personal hobbies, and/or geographic and cultural interests	
C-8.2	Develop and manage a program of study for postsecondary planning	
C-8.3	Record a profile of classes specific to career interests and preparation	
C-8.4 TL	Participate in seminars for industry specific training and experiences	
C-8.5	Tour industry sites and record experiences in a personal profile	
C-8.6	Develop a resume of experiences that are related to career and postsecondary interests	
A-8.7	Collect letters of recommendation for areas of postsecondary interest	
A-8.8 TL	Collect data to document implement ion of a continuous improvement project in a classroom environment	

A-8.9 TL	Write a descriptions of the present and future states of a CI targets
A-8.10 TL	Organize a team s and develop a plans to implement CI projects
A-8.11 TL	Implement project management tools and strategies for a CI projects
C-9.12	Develop and maintain records illustrating project progress indicating before and after implementation
C-8.13	Collect data and develop a narrative description assessing the results of continuous improvement projects

Aligned Washington State Standards		
Arts		
Educational Technology	EALR 1.1.1	Innovate: Demonstrate creative thinking, construct knowledge and develop innovative products and processes using technology
	EALR 1.1.3	Investigate and Think critically: Research, manage, and evaluate information and solve problems using digital tools and resources
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	EALR 2.2.4	Adapt to Change (Technology Fluency): Transfer current knowledge to new and emerging technologies
Health and Fitness		
Language		
Math	MP.2	Reason abstractly and quantitatively.
	MP.4	Model with mathematics.
Reading	RST 9-12.1	Cite specific textual evidence to support analysis of science and technical texts, attending to important distinctions the author makes and to any gaps or inconsistencies in the account.
	RST 9-12.2	Determine the central ideas or conclusions of a text; summarize complex concepts, processes, or information presented in a text by paraphrasing them in simpler but still accurate terms.
	RST 9-12.9	Synthesize information from a range of sources (e.g., texts, experiments, simulations) into a coherent understanding of a process, phenomenon, or concept, resolving conflicting information when possible.
Science		
Social Studies		
Speaking and Listening		
Writing	WHST 9-12.9	Draw evidence from informational texts to support analysis, reflection, and research.
	WHST.9-12.8	Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the strengths and limitations of each source in terms of the specific task, purpose, and audience; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and overreliance on any one source and following a standard format for citation.

21st Century Skills		
Check those that students will demonstrate in this course:		
LEARNING & INNOVATION **Creativity and Innovation** ☒Think Creatively ☒Work Creatively with Others ☒Implement Innovations **Critical Thinking and Problem Solving** ☒Reason Effectively ☒**U**se Systems Thinking ☒Make Judgments and Decisions ☒Solve Problems **Communication and Collaboration** ☒Communicate Clearly ☒Collaborate with Others	**INFORMATION, MEDIA & TECHNOLOGY SKILLS** **Information Literacy** ☒Access and /evaluate Information ☒Use and Manage Information **Media Literacy** ☒Analyze Media ☒Create Media Products **Information, Communications and Technology (ICT Literacy)** ☒Apply Technology Effectively	**LIFE & CAREER SKILLS** **Flexibility and Adaptability** ☒Adapt to Change ☒Be Flexible **Initiative and Self-Direction** ☒Manage Goals and Time ☒Work Independently ☒Be Self-Directed Learners **Social and Cross-Cultural** ☒Interact Effectively with Others ☒Work Effectively in Diverse Teams **Productivity and Accountability** ☒Manage Projects ☒Produce Results **Leadership and Responsibility** ☒Guide and Lead Others ☒Be Responsible to Others