

*Examples from this curriculum / standards document*

# Manufacturing Technologies

## Career Field Technical Content Standards Document

with  
Academic Career Field Standards in  
English Language Arts, Mathematics and Science

2006



OHIO BOARD OF REGENTS



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**Education**

CAREER & TECHNICAL EDUCATION

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## Structure and Format

The *Manufacturing Technologies Career Field Technical Content Standards* document is composed of a series of units, competencies and descriptors as follows:

- *Units* are a grouping of competencies sharing a common subject or theme;
- *Competencies* are specific knowledge and skill statements that outline the knowledge and skills needed for career success; and
- *Descriptors* follow each competency and serve to define what is meant by the related competency.

Also included in the document are selected benchmarks from Ohio's Academic Content Standards for English Language Arts, Mathematics and Science that correlate with specific technical competencies. This incorporation of academic content standards with career field technical content standards provides an opportunity for instructional integration of content, helping to contextualize learning for students and providing the basis for collaboration across disciplines.

In addition, industry-driven, authentic assessments based on the career-technical student organization, SkillsUSA, are linked to various competencies and included in the appendix. This demonstrates the co-curricular nature of the career-technical student organization and provides an opportunity for authentic assessment of a student's knowledge and skills at the local, regional, state and national levels. Complete information on the assessments, including scoring rubrics, can be obtained at [www.ohioskillsUSA.org](http://www.ohioskillsUSA.org).

Competencies that are common across the career field and/or are critical for success in the manufacturing technologies career field are referred to as core competencies. These core competencies represent the sustaining characteristics of a career field and facilitate career readiness and long-term career success by:

- Providing the basis for effective collaboration, teamwork and communication across pathways;
- Laying the groundwork for successful transfer of knowledge and skills across pathways, thereby facilitating horizontal and vertical career success; and
- Equipping students and workers with the skills needed to transition to new and emerging careers throughout a working lifetime.

In the *Manufacturing Technologies* document, core competencies include those focusing on the following:

- Career exploration and development;
- Business processes;
- Communications;
- Problem solving and critical thinking;
- Leadership and teamwork;
- Legal and ethical aspects;
- Safety;
- Health and environment;
- Tools and equipment; and
- Manufacturing technology basics.

**Pathway competencies** are specific to one or several pathways within a larger career field. They differentiate the academic, technical and workplace knowledge and skills that are more specific than those that are relevant to the entire career field, yet they prepare students for multiple occupational specialties.

**Specialization competencies** are specific to occupational areas within the larger career pathway and career field. The Manufacturing Technologies Career Field Technical Content Standards are built around three career pathways and multiple specialization areas:

- Development and design;
- Manufacturing operations; and
- Manufacturing production:
  - Precision machining;
  - Automation and robotics;
  - Electronics;
  - Welding; and
  - Wood technology/cabinet making.

Core, pathway and specialization competencies form the basis for developing secondary and postsecondary programs, facilitating transition from one educational level to the next and to the workplace.

In the *Manufacturing Technologies Career Field Technical Content Standards*, business and labor representatives have designated competencies as *essential* or *recommended* within specific pathways and occupational areas. Educators have designated *when* (by the end of the 12<sup>th</sup> grade and/or associate degree or apprenticeship) and *to what depth* (introduced, reinforced, proficient) competencies should be addressed. Definitions used to make these designations appear on the following page, followed by a sample competency illustrating the layout of an actual competency.

## Definitions and Codes

### Determined by Business, Industry and Labor Panel (BIL)

#### Essential (E) Competency:

E = Competency is needed to ensure minimal level of employability. Entry-level employees (defined as graduates of an associate degree or apprenticeship program) should be able to perform this competency for career success.

#### Recommended (R) Competency:

R = Competency should be included but is not essential for minimal level of employability or is related only to a subspecialty within a pathway.

### Determined by Educator Panel (EDU)

#### Grade Level:

- 12 = by the end of grade 12
- AD = by the end of the associate degree program
- ApT = by the end of the apprenticeship

#### Depth:

- I = Introduce competency
- R = Reinforce, or add depth after introducing a competency, **OR** after proficiency
- P = Proficient or achievement of the competency; ability to apply knowledge of and/or perform the competency

### Determined by Academic Review Panel

#### Correlated English Language Arts Academic Content Benchmarks

Benchmarks drawn from the *Ohio English Language Arts Academic Content Standards* that have been determined to be embedded in corresponding technical competency

#### Correlated Mathematics Academic Content Benchmarks

Benchmarks drawn from the *Ohio Mathematics Academic Content Standards* that have been determined to be embedded in the corresponding technical competency

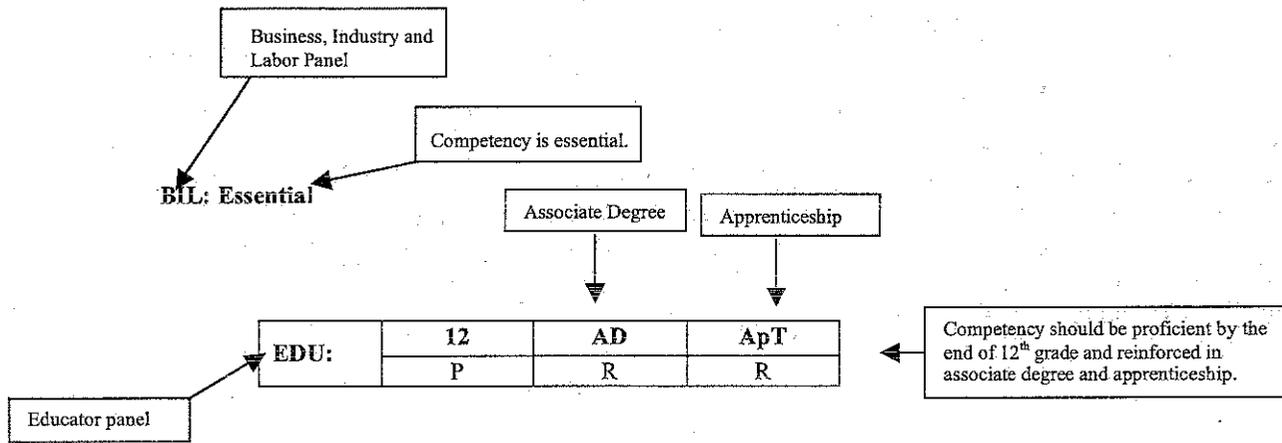
#### Correlated Science Academic Content Benchmarks

Benchmarks drawn from the *Ohio Science Academic Content Standards* that have been determined to be embedded in the corresponding technical competency

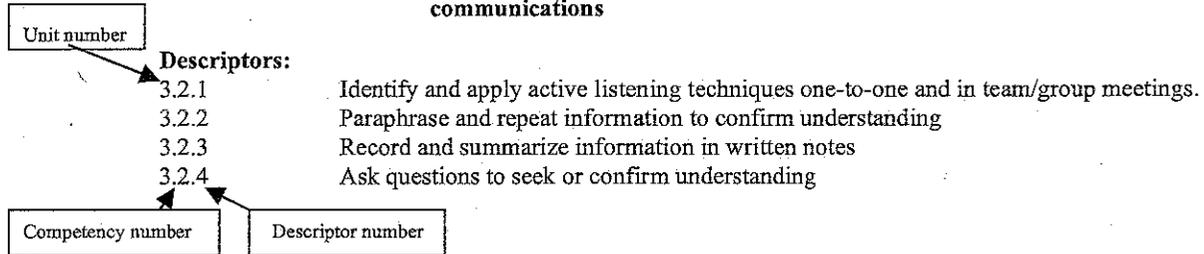
# Sample Competency

## Unit 3: Communications

**Industry-Driven Authentic Assessment: SkillsUSA (in appendix)**  
**Prepared Speech** - Evaluates each student's ability to prepare and present clearly and effectively a series of thoughts relating to a central theme.  
**Extemporaneous Speaking** - Evaluates each student's ability to give a speech on an assigned topic with a minimum of advanced notice.  
**Job Interview** - Evaluates students' written, verbal and non-verbal skills in employment procedures when applying for a position.

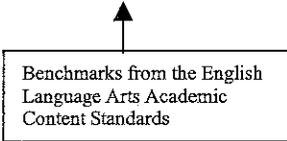


### Competency 3.2: Apply active listening skills to obtain and clarify information provided in oral communications



### Correlated English Language Arts Academic Content Benchmarks

- Use a variety of strategies to enhance listening comprehension. (Communication: Oral and Visual A, 8-10; Communication: Oral and Visual A, 11-12)



## **Manufacturing Technologies Definitions**

### **Manufacturing Operations**

Employees in manufacturing operations are responsible for the design and administration of the manufacturing process. They work with customers to ensure the manufacturing process produces a product that meets or exceeds customer expectations. They also monitor the manufacturing process and materials used to manufacture the product. Key areas of concern include quality assurance, cost, logistics and inventory control; health, safety and environmental assurance; and maintenance, installation and repair.

### **Development and Design**

Employees in product development and design are responsible for working with customers to determine what product features and functions meet customer needs. Working in teams they evaluate existing products and potential new concepts. They complete sketches, working drawings, build and evaluate models that meet customer's requirements. Key areas of concern in the product life cycle include principles of engineering, product research, design skills, manufacturing processes, quality assurance and general business practices.

### **Manufacturing Production**

Employees in manufacturing production are highly skilled professionals who are involved in the assembly and production process. Working closely with manufacturing operations and providing input and/or leadership in the development and design, these individuals typically build or repair the equipment, tools and dies that makeup the assembly or production line. They have a broad range of skills and knowledge in precision machining, automation and robotics, welding, electronics, and wood technology/cabinet making.

## 2005 Manufacturing Technologies Competency Chart

At the end of the secondary program (12), associate degree (AD), and apprenticeship (ApT) each competency is coded: I = Introductory; P = Proficient; R = Reinforce. In addition, the business, industry, and labor partnership (BIL) validated each competency: BIL: E = Essential; R = Recommended

Competency	12	AD	ApT	BIL
<b>MANUFACTURING TECHNOLOGIES CORE BODY OF KNOWLEDGE</b>				
<b>Unit 1: Career Exploration and Development</b>				
1.1 Explore career pathways in manufacturing technology.	P	R	R	E
1.2 Explore professional development and career advancement opportunities for a manufacturing technology professional.	P	R	R	E
1.3 Explain apprenticeships and their role in the manufacturing industry.	I	P	R	E
1.4 Demonstrate positive work behaviors and personal qualities.	P	R	R	E
1.5 Develop personal career goals and the objectives to meet those career goals.	P	R	R	E
<b>Unit 2: Business Processes</b>				
2.1 Develop a business process model for manufacturing operations.	I	P	R	E
2.2 Analyze the manufacturing industry.	I	P	R	R
2.3 Analyze trends and issues in the manufacturing industry.	I	P	R	E
2.4 Explain how planning and budgeting are used to accomplish organizational goals and objectives.	I	P	R	R
2.5 Explain material control and product inventories necessary to meet customer and business requirements.	I	P	R	E
2.6 Benchmark financial and market performance against competitors.	I	P	R	E
2.7 Explain how changes outside manufacturing impact the manufacturing process.	I	P	R	E
2.8 Explain the role of risk management in reducing risks and improving performance in manufacturing businesses.	I	I	R	R
2.9 Explain the roles and functions of government in regulating and supporting manufacturing business.	I	I	I	R
2.10 Explain how manufacturing businesses manage customer relationships.	I	I	I	R
2.11 Develop a management plan for business.	I	I	R	R
2.12 Identify basic procedures in the accounting cycle.	I	P	P	E
<b>Unit 3: Communications</b>				
3.1 Apply active listening skills to obtain and clarify information provided in oral communications.	P	R	R	E
3.2 Listen and speak effectively to contribute to group discussions and meetings.	P	R	R	E
3.3 Deliver formal and informal presentations that demonstrate organization and delivery skill.	P	R	R	E
3.4 Write and utilize coherent and focused technical communications that support a defined perspective.	P	R	R	E

Competency		12	AD	ApT	BIL
3.5	Employ information technology applications.	I	P	P	E
3.6	Use written documents to direct the work.	I	P	R	E
3.7	Explain the fundamentals of manufacturing drawings, schematics, specifications and diagrams.	P	R	R	E
3.8	Research and respond to customer needs.	I	P	R	E
<b>Unit 4: Problem Solving and Critical Thinking</b>					
4.1	Employ critical thinking and problem solving skills independently or in teams to formulate solutions to problems.	I	P	P	E
4.2	Apply problem solving and critical thinking techniques to the conflict between available resources, requirements of the project and manufacturing timelines.	I	P	P	E
4.3	Combine critical thinking and team building skills to solve problems.	I	P	P	E
4.4	Evaluate and adjust plans and schedules to respond to unexpected events and conditions.	I	P	P	E
<b>Unit 5: Leadership and Teamwork</b>					
5.1	Summarize the interpersonal skills that contribute to positive leadership and teamwork.	I	P	R	E
5.2	Demonstrate the ability to work on a team and recognize the importance of teamwork and its impact on business in a manufacturing environment.	P	R	R	E
5.3	Perform responsibly as a team member.	P	R	R	E
5.4	Use motivational techniques to enhance performance in others.	I	P	R	E
5.5	Describe the basic origins of conflict and the needs that motivate behavior.	P	R	R	E
5.6	Examine the different responses to conflict as they relate to results.	P	R	R	E
5.7	Resolve conflicts to maintain a smooth workflow.	P	R	R	E
<b>Unit 6: Legal and Ethical Aspects</b>					
6.1	Differentiate between legal and ethical issues.	I	P	R	E
6.2	Complete work-related duties within an ethical framework.	I	P	P	E
6.3	Assess the implications of ethical and unethical behavior.	P	R	R	E
6.4	Perform duties according to laws, regulations, contract provisions and policies.	I	P	R	E
6.5	Comply with applicable government regulations and codes.	I	P	P	E
6.6	Explain employee and employer liability.	I	P	R	E
<b>Unit 7: Safety</b>					
7.1	Maintain general safety in accordance with government regulations, health standards and company policy.	P	R	R	E
7.2	Evaluate the ergonomic factors associated with the manufacturing industry.	P	R	R	E
7.3	Identify state, federal and local worker safety, health and environmental regulations.	I	P	P	E
7.4	Demonstrate practices that contribute to an accident-free environment.	P	R	R	E
7.5	Explain emergency response plans in a variety of industrial settings.	P	R	R	E
7.6	Complete requirements for First Aid and CPR certification.	I	I	I	R
7.7	Complete and apply operations and safety training on all equipment.	P	R	R	E

**MANUFACTURING  
TECHNOLOGIES CORE  
BODY OF KNOWLEDGE**

**UNITS 1-10**

## Unit 1: Career Exploration and Development

**BIL**                      **Essential**

<b>EDU:</b>	<b>12</b>	<b>AD</b>	<b>ApT</b>
	P	R	R

**Competency 1.1:**        **Explore career pathways in manufacturing technology.**

**Descriptors:**

- 1.1.1            Identify current and future career options in manufacturing technology.
- 1.1.2            Research the historical evolution of the various careers in manufacturing technology.
- 1.1.3            Experience specific manufacturing interests (e.g., shadowing, professional readings, community service, internship).
- 1.1.4            Identify education and training needed for a career in manufacturing technology.

**Correlated English Language Arts Academic Content Benchmarks**

- *Use multiple resources to enhance comprehension of vocabulary.* (Acquisition of Vocabulary F, 8-10; Acquisition of Vocabulary E, 11-12)
- *Formulate open-ended research questions suitable for investigation and adjust questions as necessary while research is conducted.* (Research A, 8-10)
- *Formulate open-ended research questions suitable for inquiry and investigation and adjust questions as necessary while research is conducted.* (Research A, 11-12)
- *Evaluate the usefulness and credibility of data and sources.* (Research B, 8-10)
- *Compile, organize and evaluate information, take notes and summarize findings.* (Research B, 11-12)

**Correlated Science Academic Content Benchmarks**

- *Recognize that scientific literacy is part of being a knowledgeable citizen.* (Scientific Ways of Knowing D, 9-10)
- *Explain how societal issues and considerations affect the progress of science and technology.* (Scientific Ways of Knowing C, 11-12)

**BIL:**                      **Essential**

<b>EDU:</b>	<b>12</b>	<b>AD</b>	<b>ApT</b>
	P	R	R

**Competency 1.2:**        **Explore professional development and career advancement opportunities for a manufacturing technology professional.**

**Descriptors:**

- 1.2.1            Identify advancement opportunities in manufacturing technology (e.g., internal and external).
- 1.2.2            Research continuing education courses or programs available to enhance skills, to remain current in the profession, and for career advancement (e.g., governing organizations and requirements).
- 1.2.3            Describe the importance of professional organizations, associations, trades shows, seminars and professional relationships with manufacturing technology professionals.
- 1.2.4            Remain current on changes in the manufacturing technology profession.

- 1.2.5 Demonstrate quality work as measured by performance evaluations.
- 1.2.6 Maintain a résumé, a list of references, and a portfolio.
- 1.2.7 Prepare for job interviews.

**Correlated English Language Arts Academic Content Benchmarks**

- *Produce letters (e.g., business, letters to the editor, job applications) that follow the conventional style appropriate to the text and that include appropriate details and exclude extraneous details and inconsistencies. (Writing Applications C, 8-10)*
- *Formulate open-ended research questions suitable for investigation and adjust questions as necessary while research is conducted. (Research A, 8-10)*
- *Formulate open-ended research questions suitable for inquiry and investigation and adjust questions as necessary while research is conducted. (Research A, 11-12)*
- *Compile, organize and evaluate information, take notes and summarize findings. (Research B, 11-12)*
- *Evaluate the usefulness and credibility of data and sources and synthesize information from multiple sources. (Research C, 11-12)*

**BIL: Essential**

EDU:	12	AD	ApT
	I	P	R

**Competency 1.3: Explain apprenticeships and their role in the manufacturing industry.**

**Descriptors:**

- 1.3.1 Define apprentice, apprenticeships and apprenticeable occupations (e.g., welder, machinist, industrial electrician).
- 1.3.2 Define journey person and indentured.
- 1.3.3 Contrast registered and non-registered apprenticeships.
- 1.3.4 Distinguish related instruction from on-the-job training in an apprenticeship pathway.

**Correlated English Language Arts Academic Content Benchmarks**

- *Apply knowledge of roots and affixes to determine the meanings of complex words and subject area vocabulary. (Acquisition of Vocabulary E, 8-10)*
- *Use multiple resources to enhance comprehension of vocabulary. (Acquisition of Vocabulary F, 8-10; Acquisition of Vocabulary E, 11-12)*
- *Communicate findings, reporting on the substance and processes orally, visually and in writing or through multimedia. (Research E, 8-10; Research E, 11-12)*

**BIL:**            **Essential**

<b>EDU:</b>	<b>12</b>	<b>AD</b>	<b>ApT</b>
	P	R	R

**Competency 1.4:        Demonstrate positive work behaviors and personal qualities.**

**Descriptors:**

- 1.4.1        Conform to company and departmental policies (e.g., attendance, punctuality, time management).
- 1.4.2        Demonstrate professionalism, self-discipline, self-worth, positive attitude and integrity in a work situation.
- 1.4.3        Demonstrate flexibility and willingness to learn.
- 1.4.4        Exhibit a commitment to the organization.
- 1.4.5        Explain how individuals impact manufacturing performance.
- 1.4.6        Describe the expectations for individuals in terms of manufacturing performance.
- 1.4.7        Identify impact areas of individual performance (e.g., quality, profit, customer relations).
- 1.4.8        Discuss the importance of having all individuals understanding the core business processes of manufacturing organizations.

**Correlated English Language Arts Academic Content Benchmarks**

- *Give presentations using a variety of delivery methods, visual displays and technology.* (Communication: Oral and Visual G, 8-10; Communication: Oral and Visual F, 11-12)

**BIL:**            **Essential**

<b>EDU:</b>	<b>12</b>	<b>AD</b>	<b>ApT</b>
	P	R	R

**Competency 1.5:        Develop personal career goals and the objectives to meet those career goals.**

**Descriptors:**

- 1.5.1        Explore career opportunities in manufacturing technology.
- 1.5.2        Identify the educational and professional requirements for each career opportunity.
- 1.5.3        Demonstrate the ability to seek and apply for employment.
- 1.5.4        Demonstrate ability to evaluate and compare employment opportunities and accept employment.

**Correlated English Language Arts Academic Content Benchmarks**

- *Produce letters (e.g., business, letters to the editor, job applications) that follow the conventional style appropriate to the text and that include appropriate details and exclude extraneous details and inconsistencies.* (Writing Applications C, 8-10)
- *Produce functional documents that report, organize and convey information and ideas accurately, foresee readers' problems or misunderstandings and that include formatting techniques that are user friendly.* (Writing Applications C, 11-12)
- *Evaluate the usefulness and credibility of data and sources.* (Research B, 8-10)
- *Compile, organize and evaluate information, take notes and summarize findings.* (Research B, 11-12)

**Unit 2: Business Processes**  
 (Industry-Driven Authentic Assessment, See Appendix)

**BIL:** Essential

<b>EDU:</b>	<b>12</b>	<b>AD</b>	<b>ApT</b>
	<b>I</b>	<b>P</b>	<b>R</b>

**Competency 2.1: Develop a business process model for manufacturing operations.**

**Descriptors:**

- 2.1.1 Define business processes.
- 2.1.2 Identify and explain the core business processes in manufacturing (e.g., product development, sourcing and planning, manufacturing and logistics).
- 2.1.3 Prepare a diagram, chart and/or model that illustrates the manufacturing business processes.
- 2.1.4 Prepare a diagram, chart and/or model that illustrates one segment of the manufacturer's business processes (e.g., new product design and development).
- 2.1.5 Illustrate manufacturing strategies and tactics in the business process model.
- 2.1.6 Trace and evaluate the interrelated activities performed to produce a product and serve a customer.

**Correlated English Language Arts Academic Content Benchmarks**

- *Use multiple resources to enhance comprehension of vocabulary.* (Acquisition of Vocabulary F, 8-10; Acquisition of Vocabulary E, 11-12)
- *Produce functional documents that report, organize and convey information and ideas accurately, foresee readers' problems or misunderstandings and that include formatting techniques that are user friendly.* (Writing Applications C, 11-12)
- *Give presentations using a variety of delivery methods, visual displays and technology.* (Communication: Oral and Visual F, 11-12)

**Correlated Mathematics Academic Content Benchmarks**

- *Translate information from one representation (words, table, graph or equation) to another representation of a relation or function.* (Patterns, Functions and Algebra C, 8-10)
- *Use algebraic representations, such as tables, graphs, expressions, functions and inequalities, to model and solve problem situations.* (Patterns, Functions and Algebra D, 8-10)
- *Construct convincing arguments based on analysis of data and interpretation of graphs.* (Data Analysis and Probability F, 8-10)

**BIL:** Recommended

<b>EDU:</b>	<b>12</b>	<b>AD</b>	<b>ApT</b>
	I	P	R

**Competency 2.2: Analyze the manufacturing industry.**

**Descriptors:**

- 2.2.1 Categorize manufactured goods by type (e.g., medical, petroleum, metal).
- 2.2.2 Identify and describe types of manufacturing systems.
- 2.2.3 Identify the customers, suppliers and stakeholders, and describe their roles and how they relate.
- 2.2.4 Explain the impact of long term goals and planning on organization success.
- 2.2.5 Explain the major competitive challenges faced by manufacturing businesses.
- 2.2.6 Describe historical influences on manufacturing (e.g., the labor movement, foreign competition, high performance, quality).

**Correlated English Language Arts Academic Content Benchmarks**

- *Examine the relationships of analogical statements to infer word meanings.* (Acquisition of Vocabulary B, 8-10)
- *Demonstrate comprehension of print and electronic text by responding to questions (e.g., literal, inferential, evaluative and synthesizing).* (Reading Process B, 8-10; Reading Process B, 11-12)
- *Compile, organize and evaluate information, take notes and summarize findings.* (Research B, 11-12)

**Correlated Mathematics Academic Content Benchmarks**

- *Create, interpret and use graphical displays and statistical measures to describe data; e.g., box-and-whisker plots, histograms, scatterplots, measures of center and variability.* (Data Analysis and Probability A, 8-10)
- *Communicate mathematical ideas orally and in writing with a clear purpose and appropriate for a specific audience.* (Mathematical Processes I, 11-12)
- *Apply mathematical modeling to workplace and consumer situations, including problem formulation, identification of a mathematical model, interpretation of solution within the model, and validation to original problem situation.* (Mathematical Processes J, 11-12)

**BIL:** Essential

<b>EDU:</b>	<b>12</b>	<b>AD</b>	<b>ApT</b>
	I	P	R

**Competency 2.3: Analyze trends and issues in the manufacturing industry.**

**Descriptors:**

- 2.3.1 Explain economic, labor and environmental factors related to manufacturing.
- 2.3.2 Explain quality assurance systems and how they contribute to effective work organizations.
- 2.3.3 Explain foreign out-sourcing and its impact on the national economy.
- 2.3.4 Describe productivity issues related to manufacturing. (e.g., scrap, employee productivity, quality)

- 2.3.5 Identify technological advancements and describe how they have influenced manufacturing processes.
- 2.3.6 Explain the cost and benefits of technological innovations.

**Correlated English Language Arts Academic Content Benchmarks**

- *Use multiple resources to enhance comprehension of vocabulary.* (Acquisition of Vocabulary F, 8-10; Acquisition of Vocabulary E, 11-12)
- *Demonstrate comprehension of print and electronic text by responding to questions (e.g., literal, inferential, evaluative and synthesizing).* (Reading Process B, 8-10; Reading Process B, 11-12)
- *Produce functional documents that report, organize and convey information and ideas accurately, foresee readers' problems or misunderstandings and that include formatting techniques that are user friendly.* (Writing Applications C, 11-12)

**Correlated Mathematics Academic Content Benchmarks**

- *Use algebraic representations, such as tables, graphs, expressions, functions and inequalities, to model and solve problem situations.* (Patterns, Functions and Algebra D, 8-10)
- *Construct convincing arguments based on analysis of data and interpretation of graphs.* (Data Analysis and Probability F, 8-10)
- *Connect statistical techniques to applications in workplace and consumer situations.* (Data Analysis and Probability D, 11-12)
- *Locate and interpret mathematical information accurately, and communicate ideas, processes and solutions in a complete and easily understood manner.* (Mathematical Processes H, 8-10)
- *Communicate mathematical ideas orally and in writing with a clear purpose and appropriate for a specific audience.* (Mathematical Processes I, 11-12)

**Correlated Science Academic Content Benchmarks**

- *Explain the ways in which the processes of technological design respond to the needs of society.* (Science and Technology A, 9-10)
- *Explain that science and technology are interdependent; each drives the other.* (Science and Technology B, 9-10)

**BIL: Recommended**

<b>EDU:</b>	<b>12</b>	<b>AD</b>	<b>ApT</b>
	I	P	R

**Competency 2.4: Explain how planning and budgeting are used to accomplish organizational goals and objectives.**

**Descriptors:**

- 2.4.1 Explain how work plans and budgets are used to allocate people and resources.
- 2.4.2 Identify reports used to track performance and resources and explain how they are used.
- 2.4.3 Explain how plans and budgets are revised to meet goals and objectives.
- 2.4.4 Explain the impact of long term goals and planning on organization performance.
- 2.4.5 Identify and describe the most critical performance problems that manufacturing businesses typically face.
- 2.4.6 Describe how improvements are identified and modifications are implemented.

# **Appendix A**

## **Industry-Driven Authentic Assessment Based on SkillsUSA**

## **Appendix A**

### **Industry-Driven Authentic Assessment Based on SkillsUSA**

Industry-driven, authentic assessments based on the career-technical student organization, SkillsUSA, are linked to various competencies. This linkage demonstrates the co-curricular nature of the career-technical student organization and provides an opportunity for authentic assessment of a student's knowledge and skills at the local, regional, state and national levels. Complete information on the assessments, including scoring rubrics, can be obtained at [www.ohioskillsusa.org](http://www.ohioskillsusa.org).

#### **Unit 2: Business Practices**

##### **Industry-Driven Authentic Assessment: SkillsUSA**

**Customer Service** – Evaluates an individual's ability to apply concepts of communication, professionalism, ethics and the business process to the field of customer service.

#### **Unit 3: Communications**

##### **Industry-Driven Authentic Assessment: SkillsUSA**

**Prepared Speech** – Evaluates an individual's ability to apply concepts of English language arts to prepare and present a series of thoughts relating to a central theme clearly and effectively.

**Extemporaneous Speaking** – Evaluates an individual's ability to apply concepts of English language arts and communication to give a speech on an assigned topic with a minimum of advance notice.

**Job Interview** – Evaluates an individual's ability to apply concepts of English language arts in written, verbal and non-verbal form in employment procedures as applied to an employment opportunity.

#### **Unit 6: Leadership and Teamwork**

##### **Industry-Driven Authentic Assessment: SkillsUSA**

**American Spirit** – Evaluates a local chapter's ability to work as a team in activities such as community service or citizenship projects.

**Chapter Business Procedure** – Evaluates a local chapter's ability to work as a team to conduct a meeting using correct parliamentary procedure.

**Chapter Display** – Evaluates a local chapter's ability to work as a team to construct a promotional display.

**Community Service** – Evaluates a local chapter's ability to give leadership to a community service project and to work as a team to realize positive outcomes.

## **Unit 7: Safety**

### **Industry-Driven Authentic Assessment: SkillsUSA**

**Occupational Health and Safety** – Evaluates a team’s promotion of good health and safety habits in the workplace.

**First Aid and CPR** – Evaluates a student’s ability to react positively in a simulated situation demanding first aid intervention and to recognize excellence and professionalism in administering first aid and cardiopulmonary resuscitation (CPR).

## **Unit 8: Health and Environment**

### **Industry-Driven Authentic Assessment: SkillsUSA**

**Occupational Health and Safety** – Evaluates a team’s promotion of good health and safety habits in the workplace.

**First Aid and CPR** – Evaluates a student’s ability to react positively in a simulated situation demanding first aid intervention and to recognize excellence and professionalism in administering first aid and cardiopulmonary resuscitation (CPR).

## **Unit 9: Tools and Equipment**

### **Industry-Driven Authentic Assessment: SkillsUSA**

**Job Skills Demonstration** – Evaluates an individual’s ability to apply and verbalize concepts of mathematics, science, and technology to demonstrate and explain an entry-level skill used in the occupation area for which he or she is training

## **Unit 10: Basic Manufacturing Skills**

### **Industry-Driven Authentic Assessment: SkillsUSA**

**Job Skills Demonstration** – Evaluates an individual’s ability to apply and verbalize concepts of mathematics, science, and technology to demonstrate and explain an entry-level skill used in the occupation area for which he or she is training.

## **Units 18 – 24 Development and Design**

### **Industry-Driven Authentic Assessment: SkillsUSA**

**Advertising Design** – Evaluates an individual’s ability to apply and verbalize concepts of mathematics, science and technology to demonstrate technical skills and creative aptitude just as though contestants worked for an ad agency. Competitors produce a mechanical layout including color separations, using traditional manual skills of measuring, inking, cutting amber, color registration, photo scaling, type kerning and leading. They also produce a mechanical layout on the computer. The creative portion involves applying creative thinking and developing a design problem. Layout, drawing and illustration are used.

**Technical Drafting** - Evaluates an individual's ability to apply and verbalize concepts of mathematics, science and technology to demonstrate, create and produce drawings and data files that solve industry-developed engineering design problems. Contestants must generate a solid model of a component from an engineered problem and produce drawings from an engineered assembly. A computer aided drafting and design (CADD) system — of the contestant's choice — is used to generate all drawings.

## **Units 25 – 33 Precision Machining**

### **Industry-Driven Authentic Assessment: SkillsUSA**

**Precision Machining Technology** - Evaluates an individual's ability to apply and verbalize concepts of mathematics, science and technology to demonstrate manual machining skills and knowledge areas, including operating manual milling machines, lathes, drill presses and surface grinders. Contestant knowledge of computer numerical control (CNC) programming skills using a personal computer (PC) will be evaluated. Related knowledge and skill in the areas of interpreting engineering drawings, technical math, machining practices, using precision measuring and hand tools, and ability to communicate verbally using proper industry terminology are also part of the evaluation.

**CNC Milling Technology** – Evaluates an individual's ability to apply and verbalize concepts of mathematics, science and technology to perform an upper-level computer numerically controlled (CNC) programming and machining skills. Students receive a part drawing and materials and are asked to write the CNC program, set up the machine and produce the part.

## **Units 34 – 39 Automation and Robotics**

### **Industry-Driven Authentic Assessment: SkillsUSA**

**Robotics and Automation Technology** – Evaluates an individual's ability to apply and verbalize concepts of mathematics, science and technology to demonstrate operating an Intelitek ER-4U, 5-axis servo-robot along with a set of sensors and motorized devices to resolve a simulated production process problem. The students demonstrate and set up a robotic work cell from a word problem task. The students will also be evaluated on their creation of a flowchart and sequence of operation.

**Automated Manufacturing Technology** – Evaluates an individual's ability to apply and verbalize concepts of mathematics, science and technology to generate a plot file that will be used to send data to a plotter. The contest evaluates teams for employment in integrated manufacturing technology fields of computer aided drafting and design (CADD), computer aided manufacturing (CAM), and computer numerical controlled machining (CNC). CADD operators construct the part geometry, the CAM operator generates the tool paths, and the CNC operator sets up and machines the part.

## Units 40 – 43 Electronics

### Industry-Driven Authentic Assessment: SkillsUSA

**Electronics Application** - Evaluates an individual's ability to apply and verbalize concepts of mathematics, science and technology to demonstrate applications in three different areas of electronics. The first requires students to logically troubleshoot functional building blocks of electronics systems using modern test equipment on audio systems, power supplies, microprocessors, digital technology and video systems. The second evaluates soldering and desoldering skills, workmanship and assembly techniques in constructing an electronics project. The third part is a written exam on safety procedures, electronic devices and electronics concepts.

**Electronics Technology** – Evaluates an individual's ability to apply and verbalize concepts of mathematics, science and technology by testing knowledge of analog and digital circuitry, ability to troubleshoot electronic circuits, ability to construct and test experimental circuits, ability to design and select circuit components, and ability to assemble an electronic circuit. All aspects of the competition test contestants' abilities to use and calibrate electronic equipment, record and organize data, and demonstrate proper safety practices.

## Units 44 – 54 Welding

### Industry-Driven Authentic Assessment: SkillsUSA

**Welding** – Evaluates an individual's ability to apply and verbalize concepts of mathematics, science and technology to demonstrate various aspects of welding: measuring weld replicas, using weld measuring gauges; laying out a plate and using oxy-acetylene equipment to cut several holes that are checked for accuracy and quality; gas metal arc welding (GMAW) on steel, making welds in various positions using short circuiting transfers; and using a combination machine capable of providing the correct welding current for shielded metal arc welding (SMAW) and gas tungsten arc welding (GTAW). The student completes the steel project and welds an aluminum project in various positions using a variety of filler metals.

## Units 55 Wood Products Technology

### Industry-Driven Authentic Assessment: SkillsUSA

**Cabinet Making** - Evaluates an individual's ability to apply and verbalize concepts of mathematics, science and technology to perform select technical skills necessary to interpret information and job sheets, assemble and install components, apply wood veneers and plastic laminates, cut and shape components, and design and lay out plans.

# **Appendix B**

## **College Tech Prep Pathway Template**

**CAREER PATHWAY  
TEMPLATE**

Grade	English	Mathematics	Science	Social Studies	Other Required and Recommended Academic Courses	Recommended Career and Other Elective Courses
9						
10						
11						
<b>After 10th or 11th grade, assess for college readiness, provide academic and career advising, and apply appropriate enrichments</b>						
12						
Administer college placement exams (in reading, math and writing) and other assessments to determine academic readiness and career skill preparedness; provide academic and career advising and additional preparation						
Year 1 1 <sup>st</sup> Quarter						
Year 1 2 <sup>nd</sup> Quarter						
Year 1 3 <sup>rd</sup> Quarter						
Year 2 1 <sup>st</sup> Quarter						
Year 2 2 <sup>nd</sup> Quarter						
Year 2 3 <sup>rd</sup> Quarter						

High School Required and Recommended Academic and Career Courses

College Required and Recommended Academic and Career Specialization Courses

Adult Learner Entry Points

The shading provides an example; your site may have a different number of required and recommended courses in each area. We recommend that support documentation, such as competencies and learning objectives, be attached.

**High School Required Courses**

Mandatory Assessments, Advising and Additional Preparation

Recommended Academic Courses

**Recommended Career-related Courses**

Credit-Based Transition Programs (e.g., Dual or Concurrent Enrollment, Articulated Courses, 2+2)

College Required and Recommended Academic and Career Specialization Courses



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