Advanced Machine Tool Technology Current Standards

INDICATOR #AMT 1: Demonstrate knowledge of safety and essential academic concepts in machine tool.
SUB-INDICATOR 1.1 (Webb Level: 2 Skill/Concept): Prove knowledge of shop operations and tool safety procedures consistent with Occupational Safety and Health Administration (OSHA) standards.
SUB-INDICATOR 1.2 (Webb Level: 2 Skill/Concept): Apply advanced concepts, including machine tool mathematics, blueprint reading, science, and communications to machine tool processes.
SUB-INDICATOR 1.3 (Webb Level: 2 Skill/Concept): Demonstrate and apply computer numerical control (CNC) programming concepts
INDICATOR #AMT 2: Demonstrate ability through research, development, and implementation to create a project
SUB-INDICATOR 2.1 (Webb Level: 3 Strategic Thinking): Design, analyze and create various types of projects utilizing previous knowledge and skills to manufacture a single or assembled project.
SUB-INDICATOR 2.2 (Webb Level: 3 Strategic Thinking): Evaluate and solve issues related to lathe and milling setups and operations.
INDICATOR #AMT 3: Demonstrate ethical practices and research career pathways
SUB-INDICATOR 3.1 (Webb Level: 3 Strategic Thinking): Identify and demonstrate professional practices used in the machine shop
SUB-INDICATOR 3.2 (Webb Level: 4 Extended Thinking): Evaluate and describe career exploration activities to follow for a minimum of two different career pathways.

Advanced Machine Tool Technology Proposed Standards

	AMT 1: Demonstrate knowledge of safety and essential academic concepts in machine tool.
Level 2: Skill/Concept	AMT 1.1 Prove knowledge of shop operations and tool safety procedures consistent with Occupational Safety and Health Administration (OSHA) standards.
Level 2: Skill/Concept	AMT 1.2 Apply advanced concepts, including machine tool mathematics, mechanical drawing, science, and communications to machine tool processes.
Level 2: Skill/Concept	AMT 1.3 Demonstrate and apply computer numerical control (CNC) programming concepts.
	AMT 2: Demonstrate machine use and functions, utilizing problem solving skills to resolve machining issues.
Level 3: Strategic Thinking	**AMT 2.1 Utilize prior knowledge of tools, methods of measurement, materials, and material layout.**
Level 3: Strategic Thinking	AMT 2.2 Set up and run lathe and milling machines to do advanced machining operations.
Level 4: Extended Thinking	AMT 2.3 Evaluate and solve issues related to lathe and milling setups and operations.
	AMT 3: Apply career readiness skills in the workplace as they relate to today's society.
Level 1: Recall	AMT 3.1 Identify and demonstrate career readiness (soft skills) in the workplace.
	AMT 4: Machine tool technology career exploration and development.
Level 2: Skill/Concept	AMT 4.1 Define and compare career pathways in machine tool technology.
Level 4: Extended Thinking	AMT 4.2 Design a personal learning plan for career interest in machine tool technology.
Level 2: Skill/Concept	AMT 4.3 Explain trends and issues in machine tool technology careers.

Introduction to Manufacturing Current Standards

INDICATOR #IM 1: Career exploration and development.
SUB-INDICATOR 1.1 (Webb Level: 1 Recall): Recognize the various career pathways/occupations that are available in manufacturing process/industry/business.
SUB-INDICATOR 1.2 (Webb Level: 4 Extended Thinking): Design a career path for individual career interest in the manufacturing cluster.
INDICATOR #IM 6: Differentiate among a variety of manufacturing industries.
SUB-INDICATOR 6.1 (Webb Level: 2 Skill/Concept): Research and understand basic concepts of the manufacturing career pathways.

INDICATOR #IM 2: Plan, manage and perform the processing of materials into intermediate or final products and understand related professional and technical support activities such as production planning and control, maintenance and manufacturing/process engineering.
SUB-INDICATOR 2.1 (Webb Level: 3 Strategic Thinking): Develop a business plan for manufacturing operations.
SUB-INDICATOR 2.2 (Webb Level: 1 Recall): Explain trends and issues in the manufacturing industry.
SUB-INDICATOR 2.3 (Webb Level: 3 Strategic Thinking): Demonstrate a management plan for the manufacturing process for the production of a product and/or business

INDICATOR #IM 3: Implement manufacturing technology safety practices.
SUB-INDICATOR 3.1 (Webb Level: 1 Recall): Maintain general safety in accordance with government regulations, health standards, and company and/or school policy.
SUB-INDICATOR 3.2 (Webb Level: 2 Skill/Concept): Evaluate ergonomic factors associated with the manufacturing industry.

INDICATOR #IM 4: Apply ethical practices in the workplace as they relate to today's society.
SUB-INDICATOR 4.1 (Webb Level: 1 Recall): Identify and display professional practices in the workplace.

INDICATOR #IM 5: Utilize the appropriate tools and equipment used in the manufacturing industry.
SUB-INDICATOR 5.1 (Webb Level: 2 Skill/Concept): Use basic tools and equipment common to the manufacturing processes.

INDICATOR #CE 7: Design and create a product using the engineering design loop
SUB-INDICATOR 7.1 (Webb Level: 3 Strategic Thinking): Differentiate products/components in relationship to size, proportion and tolerances.
SUB-INDICATOR 7.2 (Webb Level: 3 Strategic Thinking): Develop a prototype of a product.
SUB-INDICATOR 7.3 (Webb Level: 4 Extended Thinking): Test and evaluate a product.

Introduction to Manufacturing Proposed Standards

	IM 1: Career exploration and development.
Level 1: Recall	IM 1.1 Research the various career pathways/occupations that are available in manufacturing process/industry/business.
Level 4: Extended Thinking	IM 1.2 Design a personal learning plan for career interest in the manufacturing cluster.
Level 2: Skill/Concept	IM 1.3 Explain trends and issues in the manufacturing industry.

	IM 2: Research various manufacturing plans/drawings.
Level 1: Recall	IM 2.1 Identify the features of a manufacturing plan or technical drawing.
Level 1: Recall	IM 2.2 Identify various measurement tools used in manufacturing
Level 2: Skill/Concept	IM 2.3 Utilize various measurement tools used in manufacturing with precision
Level 2: Skill/Concept	IM 2.4 Apply mathematical concepts to measurement techniques

	IM 3: Implement manufacturing safety practices.
Level 2: Skill/Concept	IM 3.1 Identify and demonstrate general safety in accordance with government regulations, health standards, and company and/or school policy.
Level 1: Recall	IM 3.2 Identify ergonomic measures to prevent worker fatigue and injury

	IM 4: Apply career readiness skills in the workplace as they relate to today's society.
Level 1: Recall	IM 4.1 Identify and demonstrate career readiness (soft skills) in the workplace.

	IM 5: Utilize the appropriate tools and equipment used in the manufacturing industry.
Level 1: Recall	IM 5.1 Research and understand basic manufacturing tools.
Level 2: Skill/Concept	IM 5.2 Use basic tools and equipment common to the manufacturing processes.

	IM 6: Manufacture a product.
Level 3: Strategic Thinking	IM 6.1 Interpret or create basic technical drawings/plans.
Level 4: Extended Thinking	IM 6.2 Develop a prototype of a product.
Level 4: Extended Thinking	IM 6.3 Test and evaluate a product.

Introduction to Manufacturing Current Standards

SUB-INDICATOR 7.4 (Webb Level: 3 Strategic Thinking): Redesign product for final production.

Introduction to Manufacturing Proposed Standards

Level 4: Extended Thinking	IM 6.4 Redesign product for final production.

Mechanical Drafting and Design Current Standards

INDICATOR #MDD 1: Demonstrate the use of geometric construction
SUB-INDICATOR 1.1 (Webb Level: 2 Skill/Concept): Apply geometric design and descriptive geometry to the design process.
SUB-INDICATOR 1.2 (Webb Level: 3 Strategic Thinking): Demonstrate basic geometric dimensioning and tolerancing (GD&T).

INDICATOR #MDD 2: Prepare mechanical drawings.
SUB-INDICATOR 2.1 (Webb Level: 3 Strategic Thinking): Create a multi-view drawing.
SUB-INDICATOR 2.2 (Webb Level: 3 Strategic Thinking): Create sectional views of a mechanical drawing.
SUB-INDICATOR 2.3 (Webb Level: 3 Strategic Thinking): Develop auxiliary views of mechanical drawings.
SUB-INDICATOR 2.4 (Webb Level: 3 Strategic Thinking): Generate pictorial drawings.
SUB-INDICATOR 2.5 (Webb Level: 2 Skill/Concept): Examine drawing identification and management techniques used in mechanical drafting.

INDICATOR #MMD 3: Understand the design for manufacturing and assembly.
SUB-INDICATOR 3.1 (Webb Level: 1: Recall): Analyze different manufacturing processes.
SUB-INDICATOR 3.2 (Webb Level: 1: Recall): Identify basic welding symbols used in manufacturing design process.

INDICATOR #MMD 4: Explore careers in drafting fields.
SUB-INDICATOR 4.1 (Webb Level: 2 Skills/Concept): Define/compare career pathways in drafting

Mechanical Drafting and Design Proposed Standards

	MDD 1: Demonstrate the use of geometric construction
Level 2: Skill/Concept	MDD 1.1 Apply geometric design and mechanical drafting to the design process.
Level 3: Strategic Thinking	MDD 1.2 Demonstrate basic geometric dimensioning and tolerancing (GD&T).

	MDD 2: Prepare mechanical drawings.
Level 3: Strategic Thinking	MDD 2.1 Create a multi-view drawing.
Level 2: Skill/Concept	MDD 2.2 Examine drawing identification and management techniques used in mechanical drafting.
Level 3: Strategic Thinking	MDD 2.3 Create sectional views of a mechanical drawing.
Level 3: Strategic Thinking	MDD 2.4 Develop auxiliary views of mechanical drawings.
Level 3: Strategic Thinking	MDD 2.5 Generate pictorial drawings.

	MDD 3: Understand the design for manufacturing and assembly.
Level 1: Recall	MDD 3.1 Analyze different manufacturing processes.
Level 1: Recall	MDD 3.2 Identify basic welding symbols used in the manufacturing design process.

	MDD 4: Mechanical drafting career exploration and development.
Level 2: Skill/Concept	MDD 4.1 Define and compare career pathways in mechanical drafting.
Level 4: Extended Thinking	MDD 4.2 Design a personal learning plan for career interest in mechanical drafting.
Level 2: Skill/Concept	MDD 4.3 Explain trends and issues in mechanical drafting careers.

	MDD 5: Apply career readiness skills in the workplace as they relate to today's society.
Level 1: Recall	MDD 5.1 Identify and demonstrate career readiness (soft skills) in the workplace.

Machine Tool Technology
Current Standards

INDICATOR #MT 1: Demonstrate knowledge of safety and essential academic concepts in Machine Tool
SUB-INDICATOR 1.1 (Webb Level:1 Recall): Explain and show knowledge of machine shop operations and tool safety procedures consistent with Occupational Safety and Health Administration (OSHA) standards
SUB-INDICATOR 1.2 (Webb Level: 2 Skills/Concept): Introduce concepts of basic mathematics, blueprint reading, science, and communications used in machine tool processes.
SUB-INDICATOR 1.3 (Webb Level: 1 Recall): Understand basic CNC programming and processes.

INDICATOR #MT 2: Show proper machine use and functions, utilizing problem solving skills to resolve machining issues
SUB-INDICATOR 2.1 (Webb Level: 3 Strategic Thinking): Demonstrate knowledge of terminology, tools, methods of measurement, and material layout.
SUB-INDICATOR 2.2 (Webb Level: 2 Skill/Concept): Demonstrate problem solving skills in basic lathe and milling setups and operations.

INDICATOR #MT 3: Apply proper ethical standards to machining skills and processes
SUB-INDICATOR 3.1 (Webb Level:2 Skills/Concept): Identify and demonstrate professional practices used in the machine shop.

INDICATOR #MT 4: Explore Careers in the Manufacturing cluster
SUB-INDICATOR 4.1 (Webb Level: 1 Recall): Identify machine tool related career pathways.

Machine Tool Technology
Proposed Standards

	MT 1: Demonstrate knowledge of safety and essential academic concepts in machine tooling.
Level1: Recall	MT 1.1 Demonstrate knowledge of machine shop operations and tool safety procedures consistent with Occupational Safety and Health Administration (OSHA) standards
Level1: Recall	MT 1.2 Introduce concepts of basic mathematics, mechanical drafting, science, tool terminology and communications used in machine tool processes.
Level 2: Skill/Concept	MT 1.3 Demonstrate basic CNC programming and processes.

	MT 2: Show proper machine use and functions, utilizing problem solving skills to resolve machining issues
Level 3: Strategic Thinking	MT 2.1 Demonstrate knowledge of tools, methods of measurement, materials, and material layout.
Level 3: Strategic Thinking	MT 2.2 Set up and run lathe and milling machines to do basic machining operations.
Level 3: Strategic Thinking	MT 2.3 Demonstrate testing and problem-solving skills in basic lathe and milling setups and operations.

	MT 3: Apply career readiness skills in the workplace as they relate to today's society.
Level 1: Recall	MT 3.1 Identify and demonstrate career readiness (soft skills) in the workplace.

	MT 4: Machine tool technology career exploration and development.
Level2: Skill/Concept	MT 4.1 Define and compare career pathways in machine tool technology.
Level 4: Extended Thinking	MT 4.2 Design a personal learning plan for career interest in machine tool technology.
Level 2: Skill/Concept	MT 4.3 Explain trends and issues in machine tool

Welding Technology Current Standards		**Welding Technology Proposed Standards**
INDICATOR #WT 1: Identify and understand welding safety.		**WT 1: Implement welding safety practices.**
SUB-INDICATOR 1.1 (Webb Level: 2 Skill/Concept): Identify and demonstrate proper industry safety standards.	Level 2: Skill/Concept	WT 1.1 Identify and demonstrate general safety in accordance with government regulations, health standards, and company and/or school policy
INDICATOR #WT 2: Read, comprehend, and communicate written and spoken technical terminology and instructions related to welding and welded assemblies.		**WT 2: Integrate core academic concepts as used in the welding industry.**
SUB-INDICATOR 2.1 (Webb Level: 2 Skill/Concept): Demonstrate mathematical skills related to work assignments.	Level 2: Skill/Concept	WT 2.1 Apply mathematical concepts to measurement techniques
SUB-INDICATOR 2.2 (Webb Level: 1 Recall): Read and demonstrate understanding of welding terms and definitions from American National Standards Institute (ANSI)/American Welding Society (AWS) A3.0, Standard Welding Terms and Definitions.	Level 1: Recall	WT 2.2 Read, comprehend, and communicate welding terms and definitions from American National Standards Institute (ANSI)/American Welding Society (AWS) A3.0, Standard Welding Terms and Definitions
INDICATOR #WT 3: Interpret drawings and welding symbol information.		**WT 3: Interpret drawings and welding symbol information.**
SUB-INDICATOR 3.1 (Webb Level: 3 Strategic Thinking): Read and sketch drawings.	Level 1: Recall	WT 3.1 Identify basic weld symbols and joints
SUB-INDICATOR 3.2 (Webb Level: 1 Recall): Identify basic weld symbols.	Level 2: Skill/Concept	WT 3.2 Use appropriate lines in welding drawing
SUB-INDICATOR 3.3 (Webb Level: 1 Recall): Identify lines and joints.	Level 3: Strategic Thinking	WT 3.3 Read and sketch drawings
INDICATOR #WT 4: Understand and Perform metal cutting operations.		**WT 4: Perform thermal cutting operations.**
SUB-INDICATOR 4.1 (Webb Level: 2 Skill/Concept): Identify and explain the use of oxyfuel and plasma cutting equipment.	Level 2: Skill/Concept	WT 4.1 Identify and explain the safety, parts, and operation of thermal cutting equipment
SUB-INDICATOR 4.2 (Webb Level: 2 Skill/Concept): Prepare layouts for cutting individual parts.	Level 2: Skill/Concept	WT 4.2 Prepare layouts for cutting individual parts
SUB-INDICATOR 4.3 (Webb Level: 2 Skill/Concept): Perform cuts using oxyfuel and plasma cutting processes.	Level 3: Strategic Thinking	WT 4.3 Perform cuts using thermal cutting processes
INDICATOR #WT 5: Exhibit knowledge and perform base metal preparation.		**WT 5: Perform Shielded Metal Arc Welding (SMAW) process.**
SUB-INDICATOR 5.1 (Webb Level: 2 Skill/Concept): prepare base metal for various welding processes.	Level 2: Skill/Concept	WT 5.1 Identify and understand the safety, parts, and operation of SMAW
INDICATOR #WT 6: Understand and Perform Shielded Metal Arc Welding (SMAW) process	Level 2: Skill/Concept	WT 5.2 Define and understand the application for different Shielded Metal Arc (SMAW) electrodes
SUB-INDICATOR 6.1 (Webb Level: 1 Recall): Identify and understand SMAW equipment and setup.	Level 2: Skill/Concept	WT 5.3 Prepare base metal for various welding processes
SUB-INDICATOR 6.2 (Webb Level:,1 Recall): Define and understand the application for different Shielded Metal Arc (SMAW) electrodes.	Level 4: Extended Thinking	WT 5.4 Perform Shielded Metal Arc Welding (SMAW) process
SUB-INDICATOR 6.3 (Webb Level: 2 Skill/Concept): Demonstrate knowledge of Shielded Metal Arc Welding (SMAW) process.		
INDICATOR #WT 7: Identify and demonstrate knowledge of quality control of the welding process.		**WT 6: Identify and demonstrate knowledge of the inspection of welding and cutting processes.**
SUB-INDICATOR 7.1 (Webb Level: 3 Strategic Thinking): Demonstrate knowledge of weld quality	Level 3: Strategic Thinking	WT 6.1 Visually inspect a weld.
	Level 2: Skill/Concept	WT 6.2 Examine thermally cut surfaces and edges for discontinuities.
INDICATOR #WT 8: Participate in career exploration activities		WT 7: Welding technology career exploration and development.

Welding Technology **Current Standards**
SUB-INDICATOR 8.1 (Webb Level: 2 Skill/Concept): Research career opportunities in manufacturing/welding fields.

Welding Technology	**Proposed Standards**
Level 2: Skill/Concept	WT 7.1 Define and compare career pathways in welding technology.
Level 4: Extended Thinking	WT 7.2 Design a personal learning plan for career interest in welding technology.
Level 2: Skill/Concept	WT 7.3 Explain trends and issues in welding technology careers.

INDICATOR #WT 9: Practice ethical work behaviors
SUB-INDICATOR 9.1 (Webb Level:1 Recall): Students will follow the following required ethical practices of Manufacturing Industry.

	WT 8: Apply career readiness skills in the workplace as they relate to today's society.
Level 1: Recall	WT 8.1 Identify and demonstrate career readiness (soft skills) in the workplace.

Advanced Welding Technology Current Standards

INDICATOR #AWT 1: Identify and conform to basic welding safety standards
SUB-INDICATOR 1.1 (Webb Level: Two Skill/Concept): Identify and practice the proper industry safety standards.
INDICATOR #AWT 2: Interpret, layout, and fabricate in conformance to fabrication drawings
SUB-INDICATOR 2.1 (Webb Level: 2 Skill/Concept): Correctly interpret dimensions and locations of components in fabrication drawings.
SUB-INDICATOR 2.2 (Webb Level: 2 Skill/Concept): Correctly scale dimensions in fabrication drawings.
SUB-INDICATOR 2.3 (Webb Level: 2 Skill/Concept): Correctly interpret orthographic and pictorial plan views shown in fabrication drawings.
SUB-INDICATOR 2.4 (Webb Level: 2 Skill/Concept): Recognize and correctly interpret lines and symbols commonly used in fabrication drawings.
INDICATOR #AWT 3: Exhibit knowledge and perform base metal preparation.
SUB-INDICATOR 3.1 (Webb Level: 2 Skill/Concept): Prepare base metal for various welding processes.
INDICATOR #AWT 4: Understand and perform Gas Metal Arc Welding (GMAW) process
SUB-INDICATOR 4.1 (Webb Level: 2 Skill/Concept): Identify and understand GMAW equipment and setup.
SUB-INDICATOR 4.2 (Webb Level: 2 Skill/Concept):
INDICATOR #AWT 5: Understand and perform Gas Tungsten Arc Welding (GTAW) process
SUB-INDICATOR 5.1 (Webb Level: 2 Skill/Concept): Understand GTAW equipment and filler metals.
SUB-INDICATOR 5.2 (Webb Level: 2 Skill/Concept): Demonstrate Gas Tungsten Arc Welding (GTAW) process on Steel.
INDICATOR #AWT 6: Understand and perform Shielded Metal Arc Welding (SMAW) process
SUB-INDICATOR 6.1 (Webb Level: 2 Skill/Concept): Understand SMAW equipment and filler metals.
SUB-INDICATOR 6.2 (Webb Level: 2 Skill/Concept): Demonstrate knowledge of the Shielded Metal Arc Welding (SMAW) process.
INDICATOR #AWT 7: Understand and perform Carbon Arc cutting and gouging process
SUB-INDICATOR 7.1 (Webb Level: 2 Skill/Concept): Understand carbon arc equipment.
SUB-INDICATOR 7.2 (Webb Level: 2 Skill/Concept): Demonstrate Carbon Arc cutting process.
INDICATOR #AWT 8: Identify and demonstrate knowledge of quality control of the welding process including visual and destructive testing.

Advanced Welding Technology Proposed Standards

	AWT 1: Implement welding safety practices.
Level 2: Skill/Concept	AWT 1.1 Identify and demonstrate general safety in accordance with government regulations, health standards, and company and/or school policy.
	AWT 2: Integrate core academic concepts as used in the welding industry.
Level 3: Strategic Thinking	AWT 2.1 Demonstrate mathematical skills related to work assignments.
Level 2: Skill/Concept	AWT 2.2 Communicate using welding terms and definitions from American National Standards Institute (ANSI)/American Welding Society (AWS) A3.0, Standard Welding Terms and Definitions.
	AWT 3: Interpret, layout, and fabricate in conformance to fabrication drawings.
Level 3: Strategic Thinking	AWT 3.1 Interpret and apply dimensions and locations of components in fabrication drawings.
Level 4: Extended Thinking	AWT 3.2 Layout and fabricate according to the fabrication drawing industry standards.
	AWT 4: Perform other advanced cutting processes.
Level 2: Skill/Concept	AWT 4.1 Identify and explain the safety, parts, and operation of thermal cutting equipment
Level 2: Skill/Concept	AWT 4.2 Prepare layouts for cutting individual parts
Level 3: Strategic Thinking	AWT 4.3 Perform cuts using thermal cutting processes
	AWT 5: Perform Gas Metal Arc Welding (GMAW) process.
Level 2: Skill/Concept	AWT 5.1 Identify and understand the safety, parts, and operation of GMAW
Level 2: Skill/Concept	AWT 5.2 Prepare base metal for various welding processes.
Level 3: Strategic Thinking	AWT 5.3 Demonstrate Gas Metal Arc Welding (GMAW) on steel.
	AWT 6: Identify and demonstrate knowledge of the inspection of welding and cutting processes.
Level 3: Strategic Thinking	AWT 6.1 Visually inspect a weld.
Level 2: Skill/Concept	AWT 6.2 Examine thermally cut surfaces and edges for discontinuities
	AWT 7: Perform other advanced welding processes.
Level 2: Skill/Concept	AWT 7.1 Identify and understand the safety, parts, and operation of another advanced welding process
Level 2: Skill/Concept	AWT 7.2 Prepare base metal for various welding processes
Level 3: Strategic Thinking	AWT 7.3 Demonstrate another advanced welding process on steel

Advanced Welding Technology
Current Standards

SUB-INDICATOR 8.1 (Webb Level: 3 Strategic Thinking): Demonstrate knowledge of weld quality
INDICATOR #AWT 9: Participate in career exploration activities
SUB-INDICATOR 9.1 (Webb Level: 2 Skill/Concept): Research career opportunities in the welding pathways.

INDICATOR #AWT 10: Demonstrate ethical work behaviors
SUB-INDICATOR 10.1 (Webb Level: 1 Recall): Follow the following required ethical practices of Manufacturing Industry

Advanced Welding Technology
Proposed Standards

	AWT 8: Welding technology career exploration and development.
Level 2: Skill/Concept	AWT 8.1 Define and compare career pathways in welding technology.
Level 4: Extended Thinking	AWT 8.2 Design a personal learning plan for career interest in welding technology.
Level 2: Skill/Concept	AWT 8.3 Explain trends and issues in welding technology careers.

	AWT 9: Apply career readiness skills in the workplace as they relate to today's society.
Level 1: Recall	AWT 9.1 Identify and demonstrate career readiness (soft skills) in the workplace.