

**Architecture and Construction Career Cluster
Industrial Mechanics
Course Number: 46.41000**

Course Description:

This course introduces and emphasizes the basic skill necessary for mechanical maintenance personnel. Instruction is also provided in the basic physics concepts applicable to the mechanics of industrial production equipment, and the application of mechanical principles with additional emphasis on power transmission and specific mechanical components. *There are no prerequisites for this course.*

Course Standard 1

AC-IM-1

The following standard is included in all CTAE courses adopted for the Career Cluster/Pathways. Teachers should incorporate the elements of this standard into lesson plans during the course. The topics listed for each element of the standard may be addressed in differentiated instruction matching the content of each course. These elements may also be addressed with specific lessons from a variety of resources. This content is not to be treated as a unit or separate body of knowledge but rather integrated into class activities as applications of the concept.

Standard: Demonstrate employability skills required by business and industry.

The following elements should be integrated throughout the content of this course.

1.1 Communicate effectively through writing, speaking, listening, reading, and interpersonal abilities.

Person-to-Person Etiquette	Telephone and Email Etiquette	Cell Phone and Internet Etiquette	Communicating At Work	Listening
Interacting with Your Boss	Telephone Conversations	Using Blogs	Improving Communication Skills	Reasons, Benefits, and Barriers
Interacting with Subordinates	Barriers to Phone conversations	Using Social Media	Effective Oral Communication	Listening Strategies
Interacting with Co-workers	Making and Returning Calls		Effective Written Communication	Ways We Filter What We Hear
Interacting with Suppliers	Making Cold Calls		Effective Nonverbal Skills	Developing a Listening Attitude
	Handling Conference Calls		Effective Word Use	Show You Are Listening
	Handling Unsolicited Calls		Giving and Receiving Feedback	Asking Questions
				Obtaining Feedback
				Getting Others to Listen

Nonverbal Communication	Written Communication	Speaking	Applications and Effective Résumés
Communicating Nonverbally	Writing Documents	Using Language Carefully	Completing a Job Application
Reading Body Language and mixed Messages	Constructive Criticism in Writing	One-on-One Conversations	Writing a Cover Letter
Matching Verbal and Nonverbal communication		Small Group Communication	Things to Include in a Résumé
Improving Nonverbal Indicators		Large Group Communication	Selling Yourself in a Résumé

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Nonverbal Feedback		Making Speeches	Terms to Use in a Résumé
Showing Confidence Nonverbally		Involving the Audience	Describing Your Job Strengths
Showing Assertiveness		Answering Questions	Organizing Your Résumé
		Visual and Media Aids	Writing an Electronic Résumé
		Errors in Presentation	Dressing Up Your Résumé

1.2 Demonstrate creativity by asking challenging questions and applying innovative procedures and methods.

Teamwork and Problem Solving	Meeting Etiquette
Thinking Creatively	Preparation and Participation in Meetings
Taking Risks	Conducting Two-Person or Large Group Meetings
Building Team Communication	Inviting and Introducing Speakers
	Facilitating Discussions and Closing
	Preparing Visual Aids
	Virtual Meetings

1.3 Exhibit critical thinking and problem solving skills to locate, analyze and apply information in career planning and employment situations.

Problem Solving	Customer Service	The Application Process	Interviewing Skills	Finding the Right Job
Transferable Job Skills	Gaining Trust and Interacting with Customers	Providing Information, Accuracy and Double Checking	Preparing for an Interview	Locating Jobs and Networking
Becoming a Problem Solver	Learning and Giving Customers What They Want	Online Application Process	Questions to Ask in an Interview	Job Shopping Online
Identifying a Problem	Keeping Customers Coming Back	Following Up After Submitting an Application	Things to Include in a Career Portfolio	Job Search Websites
Becoming a Critical Thinker	Seeing the Customer's Point	Effective Résumés:	Traits Employers are Seeking	Participation in Job Fairs
Managing	Selling Yourself and the Company	Matching Your Talents to a Job	Considerations Before Taking a Job	Searching the Classified Ads
	Handling Customer Complaints	When a Résumé Should be Used		Using Employment Agencies
	Strategies for Customer Service			Landing an Internship
				Staying Motivated to Search

1.4 Model work readiness traits required for success in the workplace including integrity, honesty, accountability, punctuality, time management, and respect for diversity.

Workplace Ethics	Personal Characteristics	Employer Expectations	Business Etiquette	Communicating at Work
Demonstrating Good Work Ethic	Demonstrating a Good Attitude	Behaviors Employers Expect	Language and Behavior	Handling Anger
Behaving Appropriately	Gaining and Showing Respect	Objectionable Behaviors	Keeping Information Confidential	Dealing with Difficult Coworkers
Maintaining Honesty	Demonstrating Responsibility	Establishing Credibility	Avoiding Gossip	Dealing with a Difficult Boss
Playing Fair	Showing Dependability	Demonstrating Your Skills	Appropriate Work Email	Dealing with Difficult Customers
Using Ethical Language	Being Courteous	Building Work Relationships	Cell Phone Etiquette	Dealing with Conflict

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Showing Responsibility	Gaining Coworkers' Trust		Appropriate Work Texting	
Reducing Harassment	Persevering		Understanding Copyright	
Respecting Diversity	Handling Criticism		Social Networking	
Making Truthfulness a Habit	Showing Professionalism			
Leaving a Job Ethically				

1.5 Apply the appropriate skill sets to be productive in a changing, technological, diverse workplace to be able to work independently and apply team work skills.

Expected Work Traits	Teamwork	Time Management
Demonstrating Responsibility	Teamwork Skills	Managing Time
Dealing with Information Overload	Reasons Companies Use Teams	Putting First Things First
Transferable Job Skills	Decisions Teams Make	Juggling Many Priorities
Managing Change	Team Responsibilities	Overcoming Procrastination
Adopting a New Technology	Problems That Affect Teams	Organizing Workspace and Tasks
	Expressing Yourself on a Team	Staying Organized
	Giving and Receiving Constructive Criticism	Finding More Time
		Managing Projects
		Prioritizing Personal and Work Life

1.6 Present a professional image through appearance, behavior and language.

On-the-Job Etiquette	Person-to-Person Etiquette	Communication Etiquette	Presenting Yourself
Using Professional Manners	Meeting Business Acquaintances	Creating a Good Impression	Looking Professional
Introducing People	Meeting People for the First Time	Keeping Phone Calls Professional	Dressing for Success
Appropriate Dress	Showing Politeness	Proper Use of Work Email	Showing a Professional Attitude
Business Meal Functions		Proper Use of Cell Phone	Using Good Posture
Behavior at Work Parties		Proper Use in Texting	Presenting Yourself to Associates
Behavior at Conventions			Accepting Criticism
International Etiquette			Demonstrating Leadership
Cross-Cultural Etiquette			
Working in a Cubicle			

Support of CTAE Foundation Course Standards and Georgia Standards of Excellence L9-10RST 1-10 and L9-10WHST 1-10:

Georgia Standards of Excellence ELA/Literacy standards have been written specifically for technical subjects and have been adopted as part of the official standards for all CTAE courses.

Course Standard 2

AC-IM-2

Demonstrate appropriate safety procedures in an Industrial Environment.

- 2.1 Wear approved PPE (shoes, eye wear, gloves, hard hats, etc.).
- 2.2 Understand the importance of lockout/tag-out procedures to control various energy types (i.e. electrical, thermal (steam), hydraulic, pneumatic, or gravitational). Practice correct lockout/tag-out procedures using a padlock and tag as described under OSHA's 29 CFR 1910.147 standard, the Control of Hazardous Energy (Lockout/Tag-out).
- 2.3 Discuss the Material Safety Data Sheets (MSDS) Right-to-Know Law.
- 2.4 Identify types of fires, types of fire extinguishers, and types of protective clothing.
- 2.5 Identify the appropriate action for reporting fires and appropriate firefighting procedures.
- 2.6 Demonstrate Use of Lab Emergency Power Disconnect ("Kill Switch").
- 2.7 Demonstrate an understanding of safety precautions and procedures.
- 2.8 Demonstrate the safe use of test equipment.
- 2.9 Understand safety rules to follow when working with mechanical and electrical systems.
- 2.10 Identify and discuss the potential safety hazards and precautions of working with mechanical and electrical systems.

Course Standard 3

AC-IM-3

Understand and apply mathematic concepts and measurements as relevant to maintenance installation and repair.

- 3.1 Compare and contrast standards and metric measuring systems.
- 3.2 Use formulas to determine areas and volumes.
- 3.3 Determine drive ratios for belt drives, chain drives, and gear drives.
- 3.4 Identify and use common tools of measurement.
- 3.5 Identify and use various precision measurement instruments.

Course Standard 4

AC-IM-4

Demonstrate proper use of maintenance tools and materials in industrial systems.

- 4.1 Identify various mechanical tools used in industrial maintenance systems.
- 4.2 Demonstrate the use of the mechanical tools used in industrial systems.
- 4.3 Identify and discuss the types and characteristics of common metals used in maintenance.
- 4.4 Identify and discuss the types and characteristics of common non-metals used in maintenance.
- 4.5 Define the terminology applied to fasteners.
- 4.6 Identify common fasteners used in mechanical maintenance.
- 4.7 Demonstrate safe use of appropriate shop equipment.
- 4.8 Demonstrate the ability to use layout and measurement tools to transfer print dimensions to a part.
- 4.9 Demonstrate the safe use of equipment to drill, cut, ream, and tap in accordance with print specifications.
- 4.10 Demonstrate safe and proper use of files, grinders, and other hand and power tools in accordance with good shop practices.

Course Standard 5

AC-IM-5

Demonstrate an understanding and identify components of power transmission systems.

- 5.1 Identify common belts and the belt codes used in mechanical systems.
- 5.2 Define the common terms used in belt drive systems.
- 5.3 Align pulleys used in belt drive systems.
- 5.4 Install and tension a belt.
- 5.5 Define the common terms used in chain drive systems.
- 5.6 Identify common chains and chain codes used in chain drive systems.
- 5.7 Align a sprocket used in a chain drive system.
- 5.8 Install and tension a chain.
- 5.9 Define common terms used in gear drive systems.
- 5.10 Identify common gears used in gear drive systems.
- 5.11 Demonstrate the ability to properly use a gear gauge.
- 5.12 Remove and install gears used in a gear drive system.

Course Standard 6

AC-IM-6

Examine and explain basic system principles and components for mechanical systems.

- 6.1 Identify the different types of bearings.
- 6.2 Explain the use and applications of the different types of bearings.
- 6.3 Remove and install bearings in bore.
- 6.4 Remove and install bearings on a shaft.
- 6.5 Identify the causes of bearing failure.
- 6.6 Inspect a bearing used in mechanical systems.
- 6.7 Explain the function of packing and seals in industrial production equipment.
- 6.8 Remove and install packings and seals.
- 6.9 Identify commonly used couplings in mechanical systems.
- 6.10 Align couplings using a straight edge, feeler gauge and dial indicators.
- 6.11 Install and remove couplings in a mechanical system.
- 6.12 Define the common terms used in the lubrication process.
- 6.13 Identify the types of liquid and solid lubricants for various applications.
- 6.14 Diagnose symptoms of lubricant failure.
- 6.15 Properly and safely apply lubricants to drive components.
- 6.16 Identify and demonstrate the proper and safe use of lubricating equipment.

Course Standard 7

AC-IM-7

Demonstrate the ability to properly set up and use a pedestal grinder.

- 7.1 Inspect and clean a pedestal grinder.
- 7.2 Inspect and position eye shields and tool rests.
- 7.3 Demonstrate the proper dressing of grinding wheels.
- 7.4 Demonstrate the proper sharpening of center punches and chisels.
- 7.5 Demonstrate the proper sharpening of drill bits.

Course Standard 8

AC-IM-8

Demonstrate the ability to properly set up and use a drill press.

- 8.1 Demonstrate the proper inspecting and cleaning of a drill press.
- 8.2 Demonstrate the proper mounting and securing of a work piece.

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- 8.3 Accurately calculate proper revolutions per minute (RPMs) on a drill press.
- 8.4 Demonstrate center drilling.
- 8.5 Demonstrate the proper drilling of pilot holes.
- 8.6 Demonstrate the proper drilling of blind holes.
- 8.7 Demonstrate the proper method of drilling through holes.

Course Standard 9

AC-IM-9

Perform necessary operations in order to use a lathe.

- 9.1 Identify and explain the parts of an engine lathe.
- 9.2 Demonstrate checking oil reservoirs and cutting fluid levels.
- 9.3 Accurately calculate feeds and speeds for various materials and material diameters.
- 9.4 Demonstrate the set-up of a lathe for various feeds and speeds.
- 9.5 Demonstrate grinding general lathe cutting tools with a pedestal grinder.
- 9.6 Demonstrate the set-up and alignment of the tool post.
- 9.7 Demonstrate the set-up of the three-jaw chuck.
- 9.8 Perform facing operations.
- 9.9 Perform center drilling operations.

Course Standard 10

AC-IM-10

Perform the necessary operations to use a milling machine.

- 10.1 Identify and explain the parts of a milling machine.
- 10.2 Accurately check oil reservoirs and cutting fluid levels.
- 10.3 Accurately calculate feeds and speeds for various materials and material diameters.
- 10.4 Demonstrate the set up a mill for various feeds and speeds.
- 10.5 Demonstrate the use an edge finder to find the edge of a part.
- 10.6 Perform center drilling operations.
- 10.7 Perform countersinking operations.
- 10.8 Perform drilling operations.
- 10.9 Perform tapping operations.

Course Standard 11

AC-IM-11

Demonstrate safe operating procedures for the use of Oxyacetylene welding and cutting equipment.

- 11.1 Explain some common hazards in oxyfuel cutting.
- 11.2 Demonstrate proficiency in use of proper personal protection equipment.
- 11.3 Demonstrate proficiency in the proper use of safety data sheets.
- 11.4 Demonstrate proficiency in the proper material handling methods.
- 11.5 Explain and demonstrate proper oxyfuel cutting safety.
- 11.6 Demonstrate setting up and disassembling oxyfuel equipment.
- 11.7 Demonstrate lighting, adjusting, and making cuts with acetylene gas.

Course Standard 12

AC-IM-12

Demonstrate knowledge of basic shielded gas metal arc welding (GMAW).

- 12.1 Demonstrate setting up of equipment for gas metal arc welding (GMAW).
- 12.2 Demonstrate preparation of base metal for welding.
- 12.3 Identify and explain the American Welding Society (AWS) classification of wire.

- 12.4 Identify and explain the proper AWS codes for fillet weld quality.
- 12.5 Demonstrate performing fillet welds in the flat, horizontal, vertical, overhead positions to AWS code.

Course Standard 13

AC-IM-13

Examine how related student organizations are integral parts of career and technology education courses through leadership development, school and community service projects, and competitive events.

- 13.1 Explain the purpose, mission, objectives, motto, colors, official dress and other distinguishing characteristics of SkillsUSA.
- 13.2 Explain how participation in SkillsUSA can promote lifelong responsibility for community service, professional growth and development.
- 13.3 Explore the impact and opportunities SkillsUSA can develop to bring business and industry together with education in a positive working relationship through innovative leadership and career development programs.
- 13.4 Explore the local, state, and national opportunities available to students through participation in SkillsUSA including but not limited to conferences, competitions, community service, philanthropy, and other SkillsUSA activities.