

Manufacturing Career Cluster
Foundations of Manufacturing and Materials Science
Course Number: 21.44100

COURSE DESCRIPTION:

Foundations of Manufacturing and Materials Science is the introductory course for the Manufacturing career pathway. This course provides students with opportunities to become familiar with related careers and develop fundamental technological literacy as they learn about the history, systems, and processes of manufacturing. In addition, the course will provide an overview of the safe use of tools and equipment used in the industry.

Course Standard 1

MAN-FMMS-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
Nonverbal Feedback		Making Speeches	Terms to Use in a Résumé

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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
Showing Responsibility	Gaining Coworkers’ Trust		Appropriate Work Texting	

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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

MAN-FMMS-2

Explain the societal impact of manufacturing.

- 2.1 Track the evolution of manufacturing and its impact on society.
- 2.2 Explain the educational requirements and professional expectations associated with a career in manufacturing.
- 2.3 Describe the impact of governmental and political systems on manufacturing.
- 2.4 Explain the interaction between manufacturing industries and social change.
- 2.5 Explain how manufacturing made the United States a world leader.
- 2.6 Describe the relationship between manufacturing and the environment.
- 2.7 Explain the importance of a technologically literate workforce to the manufacturing industry.

Course Standard 3

MAN-FMMS-3

Describe the history of manufacturing.

- 3.1 Identify key historical events and their impact on manufacturing.
- 3.2 List key persons who have contributed to change in manufacturing.
- 3.3 Describe the Industrial Revolution and its impact on manufacturing.
- 3.4 Identify pioneers of the manufacturing industry.
- 3.5 Describe/debate the affect that automation has had on manufacturing.

Course Standard 4

MAN-FMMS-4

Explain the universal systems model as it relates to manufacturing.

- 4.1 Describe the processes of input, processing, output, and feedback that comprise the universal systems model.
- 4.2 Demonstrate applications of the universal systems model in manufacturing.
- 4.3 Describe the role of time, capital, people, tools and machines, energy, materials, and information within the universal systems model as it applies to manufacturing industries.

Course Standard 5

MAN-FMMS-5

Explain and apply safe work practices while performing tasks.

- 5.1 Identify safety equipment.
- 5.2 Recognize immediate, potential, and hidden hazards.
- 5.3 Perform housekeeping tasks related to maintaining a safe work environment.
- 5.4 Pass a safety test with a perfect score prior to operating equipment.
- 5.5 Demonstrate the proper safe use of tools and equipment.
- 5.6 Identify safety color codes.

Course Standard 6

MAN-FMMS-6

Identify materials and resources used in manufacturing.

- 6.1 Describe the seven basic technological resources.
- 6.2 Describe the properties of manufacturing materials.
- 6.3 Explain how materials are classified.
- 6.4 List, measure, and compare common mechanical properties of select materials.
- 6.5 List sources and costs where materials may be obtained.
- 6.6 Create a bill of materials.
- 6.7 Calculate production cost analysis.

Course Standard 7

MAN-FMMS-7

Describe the essential systems and processes involved in manufacturing.

- 7.1 Compare and contrast custom, intermittent, and continuous manufacturing systems.
- 7.2 Demonstrate fundamentals of producing technical sketches.
- 7.3 Create simple two- and three-dimensional drawings using CAD (Computer-Aided Drawing) software.
- 7.4 List common hand tools used in the maintenance, installation, and repair of equipment.
- 7.5 Identify commonly used power tools.
- 7.6 Describe primary manufacturing processes.
- 7.7 List secondary manufacturing processes.
- 7.8 Define the terms separating and forming as it relates to manufacturing.

- 7.9 Identify separating processes – traditional and non-traditional.
- 7.10 Identify forming processes including casting, molding, compression, stretching, and conditioning.
- 7.11 Differentiate between combining processes such as mixing, bonding, coating, and mechanical filtering.
- 7.12 Produce a simple part applying computer-assisted production equipment.
- 7.13 Program a robot to perform a repetitive task.
- 7.14 Create a device that will perform a task using a computer-controlled program.
- 7.15 Describe the advantages/disadvantages of the separation processing of materials using manual versus computer-controlled machinery.
- 7.16 Describe assembling processes.
- 7.17 Explain the importance of finishing processes.
- 7.18 Describe the role of quality control in the manufacturing process.
- 7.19 Explain the importance of quality control within a manufacturing system.

Course Standard 8

MAN-FMMS-8

Perform a pre-planned introductory manufacturing activity applying correct safety procedures, appropriate use of materials, and processing operations.

- 8.1 Use hand and power tools safely.
- 8.2 Demonstrate fundamentals of reading technical sketches.
- 8.3 Use English and/or metric measurement effectively in order to properly lay out a part for manufacturing.
- 8.4 Follow a production flow chart to produce a teacher-selected product.
- 8.5 Apply appropriate problem solving to improve an existing manufacturing system.

Course Standard 9

MAN-FMMS-9

Use visual and verbal communication to present employment and career opportunities in manufacturing.

- 9.1 Present a technical report to an audience regarding a researched manufacturing related career using multimedia.
- 9.2 Prepare and produce a portfolio representing experiences throughout the course of study.

Course Standard 10

MAN-FMMS-10

Explore how related career and technology student organizations are integral parts of career and technology education courses. Students will develop leadership, interpersonal, and problem-solving skills through participation in co-curricular activities associated with the Technology Student Association.

- 10.1 Explain the goals, mission and objectives of CTSO organizations.
- 10.2 Explore the impact and opportunities a student organization (TSA) can develop to bring business and education together in a positive working relationship through innovative leadership and career development programs.
- 10.3 Explore the local, state, and national opportunities available to students through participation in related student organization (TSA) including but not limited to conferences, competitions, community service, philanthropy, and other (TSA) activities.
- 10.4 Explain how participation in career and technology education student organizations can promote lifelong responsibility for community service and professional development.
- 10.5 Demonstrate teamwork, leadership, interpersonal relations, and project management.

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- 10.6 Through teamwork, apply the skills and abilities in requirements analysis and configuration control while working with plans, processes, and projects as assigned.
- 10.7 Through teamwork, use the skills required in project management to track and assess the progress of a plan, process, or project as assigned.
- 10.8 Through teamwork, apply the skills in quality assurance as well as those in process management and development for appropriate applications of systems integration techniques to an assigned project
- 10.9 Effectively use project management techniques (e.g., teamwork, appropriate time management practices, effective organizational skills, conduct analysis of cost, resources, and production capacity, and quality practices with continuous improvement).
- 10.10 Understand and demonstrate proper work ethics when working with plans, processes, and projects as assigned.