Science, Technology, Engineering and Mathematics Career Cluster
3D Modeling and Analysis
Course Number 48.54300

Course Description:

Three-Dimensional (3D) Modeling and Analysis is a one-credit course that completes the pathway in Engineering Drafting and Design. Reverse engineering strategies are recommended for third level working drawings. Computer-aided design (CAD) is recommended for use extensively with each standard in the course. Focus is on employability strategies, career studies, applied math, fasteners, working drawings, and assembly drawings. The final culmination is a presentation project that contains information mastered throughout the three courses. The prerequisite for this course is Survey of Engineering Drafting & Design.

Course Standard 1

STEM-3DMA-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
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	
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

STEM-3DMA-2

Identify the disciplines related to engineering graphics and engineering professions.

2.1 Identify and describe the professional and/or trade associations related to the engineering and engineering graphics professions.
2.2 Identify and describe related occupations within engineering graphics and engineering professions.
2.3 Research employment opportunities and education requirements for engineering graphics and engineering professions.
2.4 Participate in activities related to career interests.
2.5 Analyze an ethical situation related to engineering graphics and engineering.
2.6 Maintain a journal that relates standards in the course to the project work.

Course Standard 3

STEM-3DMA-3

Analyze applied math required by business and industry for engineering graphics.

3.1 Analyze and apply correct tolerance in regards to (American National Standard for Information Systems) ANSI and National Institute of Standards and Technology (NIST) and other international bodies that control standards.
3.2 Apply correct dimensioning techniques in regard to ANSI/NIST and other international bodies that control and recommend standards.
3.3 Apply correct usage of geometric constraints and symbols.
3.4 Calculate area and volume for basic geometric shapes.
3.5 Apply correct usage of units for given examples.
3.6 Calculate mass of given objects.
3.7 Calculate density of given objects.
3.8 Create a comparison table that discusses constraint issues (i.e. appearance, funds, space, material, personnel limitations.
3.9 Identify and explain clearance fit and degree of freedom on existing drawings.

Course Standard 4

STEM-3DMA-4

Demonstrate an understanding for fasteners and the correct application in engineering graphics and product design.

4.1 Identify and describe various types of fasteners (temporary, semi-permanent, and permanent).
4.2 Create a short paragraph that explains the importance and applications of clearance fit and degree of freedom.
4.3 Specify threads and fasteners on a technical drawing.
4.4 Generate the call-out information for a fastener.
4.5 Create technical freehand sketch of provided fastener.
4.6 Model various types of threaded connections.
4.7 Apply knowledge of strength of materials in determining the appropriate fastener.

Course Standard 5

STEM-3DMA-5

Produce a working drawing artifact that conveys all of the information needed to manufacture and assemble a design.

5.1 Demonstrate an understanding of what drawings are required to accurately present an object.
5.2 Create a project that demonstrates the impact of tension and compression on an object from a working drawing.
5.3 Orally present an understanding of callouts or balloons on working drawings.
5.4 Identify and explain important components required on a bill of materials or part list.
5.5 Create a bill of materials for an existing working drawing.
5.6 Produce a set of working drawings based on an assembled object.
5.7 Produce a detailed drawing of a threaded component.

Course Standard 6

STEM-3DMA-6

Evaluate and develop assembly drawings.

6.1 Demonstrate an understanding of the purpose and application for assembly drawings.
6.2 Create an original title block.
6.3 Determine when auxiliary or sectional views are required in an assembly drawing.
6.4 Write a short paragraph that describes when a subassembly drawing is necessary in an assembly drawing.
6.5 Demonstrate how information on the Bill of Materials relates back to the assembly drawing.
6.6 Create technical freehand sketch of an assembly drawing.
6.7 Construct accurate drawing representations of a 3D assembly model.

Course Standard 7

STEM-3DMA-7

Construct a 3D assembly model showing criteria, constraints, design, and quality of a final product by creating a presentation or capstone final project.

7.1 Identify and explain the purposes and uses of extracting geometric data from surfaces and wireframes.
7.2 Create a chart that shows what drawings are necessary to produce products based on characteristics of the product such as inclined, materials, and fasteners.
7.3 Identify the purpose and uses of rendering a model's image.
7.4 Demonstrate an understanding of the application of mass and density of materials when designing an object.
7.5 Render an image of a model.
7.6 Shade a rendered image of a model.
7.7 Animate an image of a model.
7.8 Create a summary for an analysis of the object.
7.9 Create a presentation of a model that communicates material, finish, mass, and density.
7.10 Incorporate all of pathway standards into a capstone project based on the model presentation (including material, finish, mass, and density). Required working and detail drawings like auxiliary and sectional views are to be included in the final project. Options include creating a website, portfolio, or an electronic presentation.