

Energy Career Cluster
Energy and Power: Generation, Transmission, and Distribution
Course Number: 49.53800

COURSE DESCRIPTION:

This is the second course in the Energy and Power: Generation, Transmission, and Distribution pathway and it is designed to allow students to develop a broad understanding of the energy industry including infrastructure, generation, transmission and distribution of nonrenewable, renewable, and inexhaustible energy sources. Energy sources will be researched to include the regional and global economic implications, environmental, and sustainability issues. Students will explore future trends of energy and power. Students will develop, through research, an alternative energy system that will demonstrate their understanding of a unique, as well as appropriate, approach to energy and power generation.

Course Standard 1

ENGR-EPGTD-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

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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

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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

ENRG-EPGTD-2: Students will describe the history of the energy industry.

- a. Describe the history of the United States energy industry/infrastructures.
- b. Identify the various laws and regulations that impact the energy industry.
- c. Explain the role of regulatory bodies in the energy and power industry.
- d. Explain the elements of the Clean Air Act of 1970 and 1990 and regulations necessary to protect the environment.

Course Standard 3

ENRG-EPGTD-3: Students will analyze the differing processes of generation and distribution of power and energy.

- a. Explain the flow of power and energy from generation through distribution.
- b. Explain the parts of an electric power system and its interrelations.
- c. Compare the different mechanisms of energy generation and its advantages.
- d. Contrast different forms of energy distribution and its advantages.

ACADEMIC STANDARDS:

SP3. Students will evaluate the forms and transformations of energy.

SP6. The student will describe the corrections to Newtonian physics given by quantum mechanics and relativity when matter is very small, moving fast compared to the speed of light, or very large.

SCSh3. Students will identify and investigate problems scientifically.

SCSh5. Students will demonstrate the computation and estimation skills data and developing reasonable scientific explanations.

MM3P4. Students will make connections among mathematical ideas and to other disciplines.

ELAALRC2. The student participates in discussions related to curricular learning in all subject areas.

ELAALRC3. The student acquires new vocabulary in each content area and uses it correctly.

ELAALRC4. The student establishes a context for information acquired by reading across subject areas.

Course Standard 4

ENRG-EPGTD-4: Students will explain the differences between nonrenewable, renewable, and inexhaustible types of energy sources and their impact regionally and globally.

- a. Define nonrenewable, renewable, and inexhaustible energy sources.
- b. Provide examples of nonrenewable, renewable, and inexhaustible energy sources.
- c. List appropriate uses of each of these forms of energy in specific geographical locations.

- d. Detail the positive and negative impacts of nonrenewable, renewable, and inexhaustible energy sources on the global environment, society, and the individual.

ACADEMIC STANDARDS:

SEV1. Students will investigate the flow of energy and cycling of matter within an ecosystem and relate these phenomena to human society.

SEV4. Students will understand and describe availability, allocation and conservation of energy and other resources.

SCSh4. Students use tools and instruments for observing, measuring, and manipulating scientific equipment and materials.

SCSh5. Students will demonstrate the computation and estimation skills data and developing reasonable scientific explanations.

MM3P1. Students will solve problems (using appropriate technology).

MM3P2. Students will reason and evaluate mathematical arguments.

MM3P3. Students will communicate mathematically.

MM3P4. Students will make connections among mathematical ideas and to other disciplines.

MM3P5. Students will represent mathematics in multiple ways.

ELAALRC2. The student participates in discussions related to curricular learning in all subject areas.

ELAALRC3. The student acquires new vocabulary in each content area and uses it correctly.

Course Standard 5

ENRG-EPGTD-5: Students will define alternative power and energy and list several alternative sources as well as discuss the regional implications of each, including, but not limited to, economic, environmental, and sustainability issues.

- a. Explain the existing and future needs to develop alternatives to fossil fuels as our primary source of energy.
- b. State how the wind, the earth, oceans, and waste (biomass) products can be used to supply energy.
- c. Discuss how alternative energies that utilize the wind, the earth, the oceans, and waste (biomass) were developed.
- d. Compare and contrast various locations throughout the world that would be best suited for utilization of the wind, the earth, the oceans, and waste as alternative energy sources.
- e. Develop a spreadsheet that details the economic, environmental, and sustainability issues of at least five alternative energies.

ACADEMIC STANDARDS:

SEV4. Students will understand and describe availability, allocation, and conservation of energy and other resources.

SP2. Students will evaluate the significance of energy in understanding the structure of matter and the universe.

SES5. Students will investigate the interaction of insolation and Earth systems to produce weather and climate.

SES6. Students will explain how life on Earth responds to and shapes Earth systems.

SCSh3. Students will identify and investigate problems scientifically.

SCSh5. Students will demonstrate the computation and estimation skills data and developing reasonable scientific explanations.

MM3P1. Students will solve problems (using appropriate technology).

MM3P2. Students will reason and evaluate mathematical arguments.

MM3P3. Students will communicate mathematically.

MM3P4. Students will make connections among mathematical ideas and to other disciplines.

MM3P5. Students will represent mathematics in multiple ways.

ELAALRC2. The student participates in discussions related to curricular learning in all subject areas.

ELAALRC3. The student acquires new vocabulary in each content area and uses it correctly.

ELAALRC4. The student establishes a context for information acquired by reading across subject areas.

Course Standard 6

ENRG-EPGTD-6: Students will discuss the future trends of power and energy.

- a. Define energy, power, and transportation systems.
- b. Outline the relationship between present and future trends in terms of energy, power, and transportation systems.
- c. List current organizations committed to the development of new sources of energy, power, and transportation.
- d. Define nanotechnology and state the implications in relationship to the future of energy, power, and transportation technology.
- e. Identify careers related to the development of innovative power, energy, and transportation technologies.

ACADEMIC STANDARDS:

SEV4. Students will understand and describe availability, allocation and conservation of energy and other resources.

SP2. Students will evaluate the significance of energy in understanding the structure of matter and the universe.

SP3. Students will evaluate the forms and transformations of energy.

SP6. The student will describe the corrections to Newtonian physics given by quantum mechanics and relativity when matter is very small, moving fast compared to the speed of light, or very large.

SCSh1. Students will evaluate the importance of curiosity, honesty, openness, and skepticism in science.

SCSh5. Students will demonstrate the computation and estimation skills data and developing reasonable scientific explanations.

ELAALRC2. The student participates in discussions related to curricular learning in all subject areas.

ELAALRC3. The student acquires new vocabulary in each content area and uses it correctly.

ELAALRC4. The student establishes a context for information acquired by reading across subject areas.

Course Standard 7

ENRG-EPGTD-7: Students will develop, through research, an alternative energy system that demonstrates their understanding of a unique, as well as an appropriate, approach to energy and power generation.

- a. Provide a research paper that lists innovative alternative energies.
- b. Design a system, either via computer model or prototype, which will produce power for a specific need.
- c. Submit an engineering notebook which includes a daily journal, spreadsheet, and photos that show the development of this product.
- d. Document the need for this product within the community.
- e. Present data and prototype, or computer model, to a group of peers and/or school staff/community members.

ACADEMIC STANDARDS:

SEV4. Students will understand and describe availability, allocation and conservation of energy, and other resources.

SP2. Students will evaluate the significance of energy in understanding the structure of matter and the universe.

SP3. Students will evaluate the forms and transformations of energy.

MM1P1. Students will solve problems (using appropriate technology).

MM1P3. Students will communicate mathematically.

MM1P4. Students will make connections among mathematical ideas and to other disciplines.

SCSh1. Students will evaluate the importance of curiosity, honesty, openness, and skepticism in science.

SCSh2. Students will use standard safety practices for all classroom laboratory and field investigations.

SCSh3. Students will identify and investigate problems scientifically.

SCSh4. Students use tools and instruments for observing, measuring, and manipulating scientific equipment and materials.

SCSh5. Students will demonstrate the computation and estimation skills data and developing reasonable scientific explanations.

SCSh6. Students will communicate scientific investigations and information clearly.

SCSh7. Students analyze how scientific knowledge is developed.

SCSh8. Students will understand important features of the process of scientific inquiry.

MM3P1. Students will solve problems (using appropriate technology).

MM3P2. Students will reason and evaluate mathematical arguments.

MM3P3. Students will communicate mathematically.

MM3P4. Students will make connections among mathematical ideas and to other disciplines.

MM3P5. Students will represent mathematics in multiple ways.

ELAALRC2. The student participates in discussions related to curricular learning in all subject areas.

ELAALRC3. The student acquires new vocabulary in each content area and uses it correctly.

ELAALRC4. The student establishes a context for information acquired by reading across subject areas.

Course Standard 8

ENGR-EPGTD-8

Students 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.

- a. Explain the goals, mission and objectives of CTSO organizations.
- b. 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.
- c. 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.
- d. Explain how participation in career and technology education student organizations can promote lifelong responsibility for community service and professional development.
- e. Demonstrate teamwork, leadership, interpersonal relations, and project management.
- f. Through teamwork, apply the skills and abilities in requirements analysis and configuration control while working with plans, processes, and projects as assigned.
- g. Through teamwork, use the skills required in project management to track and assess the progress of a plan, process, or project as assigned.
- h. 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
- i. 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).
- j. Understand and demonstrate proper work ethics when working with plans, processes, and projects as assigned.

Support of CTAE Foundation Course Standards and Georgia Standards of Excellence

ELACC9-10SL1: Initiate and participate effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grades 9–10 topics, texts, and issues, building on others' ideas and expressing their own clearly and persuasively.

ELACC9-10SL4: Present information, findings, and supporting evidence clearly, concisely, and logically such that listeners can follow the line of reasoning and the organization, development, substance, and style are appropriate to purpose, audience, and task.