

**Energy Career Cluster  
Energy and Power Technology  
Course Number 21.45100**

**Course Description:**

As the second course in the Energy Systems Pathway, this introductory course explores the relationship between force, work, energy, and power. Students study the characteristics, availability, conversion, control, transmission, and storage of energy and power. Students will explore and apply the principles of electrical and mechanical power systems. Students will research renewable, non-renewable resources and conservation efforts. Students will develop an awareness of the many careers that exist in energy and related technologies and their related safety regulations. Prerequisite for this course is satisfactory completion of Foundations of Engineering and Technology.

**Course Standard 1**

**ENRG-EPT-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             |

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|---|--|---------------------------|-------------------------------|
| 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-EPT-2

**Students will investigate energy, work, power, and force and analyze the relations of each.**

- 2.1 Research terms that describe the use and measurement of energy.
- 2.2 State and explain the significance of the fundamental scientific laws governing energy and power.
- 2.3 Propose how energy is measured and determine the amount of work that can be accomplished with that particular energy in a given situation.
- 2.4 Outline the differences between energy and power.
- 2.5 Create a project that states the advantages and disadvantages of the various forms of energy.

## Course Standard 3

### ENRG-EPT-3

**Identify the six simple machines and explain how each is able to change the value for force and distance in the work relation.**

- 3.1 Investigate what is meant by mechanical advantage and explain how it is determined by using force and distance in the work equation.
- 3.2 Identify the six simple machines (Lever, Wheel and Axle, Pulley, Inclined Plane, Wedge, and Screw) and create scenarios for use.
- 3.3 Investigate two ways of determining the mechanical advantage of a machine.
- 3.4 Solve problems involving simple machines, input and output forces, and mechanical advantage.
- 3.5 Describe the relationship of force and speed when either is changed by the advantage of a mechanical device.

## Course Standard 4

### ENRG-EPT-4

**Differentiate between electrical and mechanical power systems and apply the various scientific laws that govern each.**

- 4.1 Apply concepts of fluid power transfer.
- 4.2 Explain how the volume of a gas varies with changes in pressure and temperature.
- 4.3 Connect how a fluid is able to transfer force, as well as, change relationship between force and distance or speed.
- 4.4 Solve mathematical problems involving changes in pressure, temperature, and volume in fluid power transfer systems.

## Course Standard 5

### ENRG-EPT-5

**Differentiate between AC and DC circuits and apply Ohm's Law to series, parallel, and series/parallel circuits as well as state Kirchoff's Laws.**

- 5.1 Differentiate between alternating current and direct current.
- 5.2 Explain differences between series, parallel, and series-parallel circuits.
- 5.3 Define voltage, current, and resistance.
- 5.4 Calculate current, voltage, and resistance in a circuit by using Ohm's Law.
- 5.5 Define Kirchoff's Laws.

## Course Standard 6

### ENRG-EPT-6

**Describe the basic components of a small engine and explain the difference between a 4-cycle and 2-cycle engine.**

- 6.1 Describe the four-cycle engine operation and explain the purpose of each.
- 6.2 Explain valve timing and its parts.
- 6.3 Compare the lubrication system in a four-cycle engine to the system of a two-cycle engine.
- 6.4 Investigate the two-cycle engine operation and explain its principles.
- 6.5 Compare and contrast the advantages and disadvantages of two-cycle and four-cycle engines.
- 6.6 Disassemble and reassemble a basic small engine.

## Course Standard 7

### ENRG-EPT-7

**Demonstrate the importance of following safety practices for energy and power.**

- 7.1 Identify potential threats and consequences from deviation of safety procedures and improper use of tools.
- 7.2 Explain the importance of using personal protective equipment (PPE) including safety glasses, hearing protection, gloves, work boots, and hard hats and the potential dangers of failing to do so.
- 7.3 Describe the processes and policies of companies to maintain personal safety equipment (PPE) to ensure working order.
- 7.4 Demonstrate through lab activities the use of tools and equipment in compliance with user manuals and safety training.
- 7.5 Describe the appropriate first aid practices and first response procedures for electrical and nonelectrical emergencies in the workplace including: cuts, insect stings, dog bites, broken bones, spinal injury, thermal burns, chemical burns, electric shock, shock, heart attack, stroke, and unconsciousness.