

Energy Systems Application

Course Description:

This course is the third in the Energy and Power: Generation, Transmission, and Distribution pathway. It expands on the fundamentals of the energy and power industry, focusing on electric power generation, transmission, and distribution. It also covers business models, regulations, and safety within the energy industry.

Classroom Procedures:

Entering the Classroom:

- Enter the classroom quietly take out your composition notebook and record the days Learning Target, Essential Question, and Agenda. ***(No food, drinks, or phones)***.
- Gather necessary materials for the days lesson and hang all bags on the back of the chair that you are occupying. ***(Specific materials will be highlighted on the Energy Systems White Board)***.
- Begin work on opening exercise quietly.

Exiting the Classroom:

- Secure all classroom equipment and place in assigned area.
- Ensure that your area is clean and clear before leaving. ***(This includes computer workstations that you were utilizing or other assigned spaces)***.
- Turn-in classroom assignments to appropriate physical or digital drop box.
- Return to your assigned seat until the bell rings and you are dismissed by the instructor.

Disciplinary Actions: *The order and type of consequences depend on the nature and severity of the infraction.*

- Verbal Warning
- Lunch Detention and phone call home. *(Minor Infractions)*.
- Counselor Referral.

Discipline Referral. *(Major and Chronic Disciplinary Infractions)*.

Course Standards:

Standard 1: Employability Skills

- Effective communication (writing, speaking, listening, reading, interpersonal abilities)

- Demonstrate creativity and critical thinking
- Model work readiness traits (integrity, honesty, accountability, punctuality, time management, respect for diversity)
- Adapt to technological and diverse workplace
- Present a professional image

Standard 2: Electric Power Generation Equipment and Systems

- Identify and describe major parts of electric energy generation and conversion systems
- Understand the operation of power generation equipment (e.g., furnaces, boilers, turbines)
- Create diagrams to demonstrate knowledge

Standard 3: Conventional Electric Power Generation

- Compare oil, coal, and natural gas formation
- Discuss advantages and disadvantages of fossil fuels in electricity generation
- Explain hydroelectric power generation

Standard 4: Nuclear Power

- Define key nuclear energy terms (e.g., fission, fusion, isotopes)
- Discuss supply, demand, and regulations for nuclear power
- Create technical reports on nuclear power's global usage and future applications

Standard 5: Nuclear Power Generation

- Explain nuclear power creation and uranium utilization
- Develop a nuclear fuel cycle flow chart
- Compare Boiling Water Reactors and Pressurized Water Reactors
- Understand U.S. Nuclear Regulatory Commission safeguards and regulations

Standard 6: Alternative Energy Sources

- Explain how solar, wind, biomass, and wave energy produce electricity
- Compare advantages and disadvantages of alternative energy sources

Standard 7: Power Distribution and Transmission Grid

- Understand power transmission vs. distribution
- Discuss AC vs. DC transmission principles
- Identify power transmission equipment and emerging technologies (e.g., Smart Grid)

Standard 8: Natural Gas Transmission and Distribution

- Explain the natural gas transmission and distribution process
- Discuss emerging technologies and their impacts

Standard 9: Energy Conservation and Efficiency

- Define energy efficiency
- Identify techniques to reduce carbon footprint
- Examine energy distribution systems for residential and commercial use

Standard 10: Ownership of Transmission and Distribution Systems

- Compare types of ownership (investor-owned utilities, municipalities, cooperatives)
- Discuss regulations guiding energy usage

Standard 11: Safety Practices and Procedures

- Roles of federal, state, and local safety agencies
- Importance of compliance with safety standards
- Create OSHA job safety plans

Standard 12: Safety for Utility Workers

- Importance of personal protective equipment (PPE)
- First aid practices for electrical and nonelectrical emergencies

Standard 13: Principles and Concepts in the Energy Industry

- Flow of energy from generation to customer
- Roles of regulatory bodies
- Environmental laws and regulations
- Structure of energy companies
- Process of electric metering and billing

Standard 14: Career and Technology Student Organizations (CTSOs)

- Goals and mission of CTSOs
- Opportunities through participation in TSA
- Promotion of community service and professional development
- Teamwork and project management skills

Academic Standards Integration:

- **Science:** Understanding energy forms, Newtonian physics, quantum mechanics, and relativity.
- **Mathematics:** Computation and estimation skills, problem-solving, mathematical connections.
- **ELA/Literacy:** Reading, writing, and discussion skills relevant to technical subjects.

Topics Breakdown:

Career and Technology Student Organizations (CTSOs)

- Goals and mission of CTSOs
- Opportunities through participation in TSA
- Promotion of community service and professional development
- Teamwork and project management skills

The Pivotal Role of Natural Gas

- Natural Gas Production, Transmission, Distribution
- Natural Gas Direct Use, Power Generation and Future Innovation

The Drive for Grid Modernization

- Risks to our Energy Infrastructure
- The Grid Expansion Imperative
- What's so Smart about a Smart Grid?

How Bills Come Together

- Breaking Down Bills
- Deciphering the Fine Print
- Distributed Generation: Behind-the-Meter Systems

Policies and Politics in Practice

- Public Policy and the Energy Industry
- Demand-Side Management and Distributed Energy Storage

Energy Careers and Energy Justice

- Building Your Career in Energy
- Career Pathways in the Energy Industry
- Equity and Energy Justice

Assessment Methods:

Major Grades= 40% Minor Grades= 60% Total= 100%

- Classwork/Homework = Minor
- Quizzes = Minor
- Exams = Major
- Papers/Presentations/Debates = Major
- Projects & Engineering Notebook = Major

Late Assignments: Late work/assignments are defined as, “assignments that are submitted after the specific deadline”.

- Late assignments may result in scores being reduced by 5% per school day for a 25% maximum reduction (five school days).
- Late work submitted after the fifth school day will **NOT** be accepted.
- Repeated incidents of late work may result in a teacher-student-parent conference to examine and correct the student’s work habits through an academic contract.

Resources:

- Center for Electronic Workforce Development Energy Industry Fundamentals Certificate Course 2.0
- Scientific journals and articles
- Online databases and tools
- Guest speakers from the energy industry

Materials:

- 5 Composition Notebooks
- Pens or Pencils
- Wired Headphones with 3.5mm jack
- 2-3” Binder (Engineering Notebook)
- Loose Leaf Paper (College Rule OK)

This syllabus provides a structured framework for the course, ensuring a comprehensive understanding of energy and power generation, transmission, and distribution while aligning with academic standards and fostering essential employability skills.

Student Printed Name

Thomas M. Gonzales, MSCIA
Security+, Energy Industry Fundamentals

Student Signature and Date

Energy & Power/Electronic Pathways
Richmond County Technical Career Magnet
gonzath@boe.richmond.k12.ga.us
706-823-5580 ext. 1543

Parent Printed Name

Parent Signature and Date