



Course Outcome Summary

Course Information: **Power & Energy**

Description: This course is designed for anyone with an interest in power and energy. The student will learn about direct current (DC) theory and how it impacts the world of electronics. He/she will understand electronic component circuitry and develop his/her own electronic circuits. The student will also work with electric motors and electrical wiring and receive some introductory experiences in robotics through Boe-Bots. Finally, students will look at energy sources and learn how to build machines to harness these sources.

Instruction Level: **Grades 9-12**

Total Credits: **1**

Course Standards:

ACT College and Career Readiness Standards

- Interpret and use information from graphs in the coordinate plane
- Show strong understanding of the persuasive purpose of the task by taking a position on the specific issue in the prompt and offering a broad context for discussion
- Show clear movement between general and specific ideas and examples
- Show competent use of language to communicate ideas

CTE Common Core Standards

- Students will communicate and collaborate with others to accomplish tasks and develop solutions to problems and opportunities.
- Students will identify and apply employability skills
- Students will assess the benefits and challenges of working in diverse settings and on diverse teams
- Students will apply leadership skills in real-world, family, community and business and industry applications.

Career and Technology Standards

- Apply electronic theory to practice.
- Students will develop the ability to use symbols, measurements and schematics to build, test and troubleshoot electronic circuits and systems.
- Construct and measure a basic circuit using electronic components.
- Demonstrate electronic measurement to series, parallel and combination circuits.
- Students will analyze and use digital electronics.
- Students will analyze and use combinational logic analysis and design.
- Students will analyze and use sequential logic analysis and design.

- Students will explain the role of microcontrollers in process control and demonstrate use.
- Demonstrate safe and appropriate use of tools, machines and materials in electronics technology.
- Discuss, analyze and use energy systems.
- Analyze, use and discuss machine and tool use relating to energy and power systems.
- Identify and analyze responsible and efficient management of energy resources.
- Develop necessary skills in problem solving for future energy systems.
- Identify and collect information about everyday problems that can be solved by technology and generate ideas and requirements for solving a problem.
- Categorize how energy can be grouped into major forms: thermal, radiant, electrical, mechanical, chemical, nuclear and others.
- Identify tools used in energy systems.
- Follow safe procedures when using tools and equipment related to power and energy systems.

Unit

1. **Electricity**
2. **Simple Circuits**
3. **Circuit Building**
4. **Energy Sources**
5. **Wind Energy**
6. **Mechanical Energy**

Unit Outlines

1. Electricity

Standards:

- Apply electronic theory to practice
- Describe the causes and effects of static electricity.
- Identify materials that are conductors and materials that are insulators, (i.e. heat and cold).
- Demonstrate the law of charges.
- Calculate current, voltage or resistance using Ohms Law and Kirchoff's Voltage Law.

Essential Question:

Students will be able to answer the question(s):

- What is electricity?
- How do we define and quantify electricity?

Essential Knowledge:

- The student will be able to explain electricity

- Use Ohms Law and use it to solve for current, potential, and resistance in DC and AC circuits.

2. Simple Circuits

Standards:

- Demonstrate electronic measurement to series, parallel and combination circuits.
- Students will analyze and use digital electronics.
- Students will analyze and use combinational logic analysis and design.
- Students will analyze and use sequential logic analysis and design.

Essential Question:

Students will be able to answer the question(s):

- What is required to have a complete circuit?
- What types of circuits are there?

Essential Knowledge:

- The student will be able to define series, parallel and combinational circuits
- The student will be able to measure voltage, resistance and amperage of various circuits
- The student will be able to follow current flow in given circuits
- The student will be able to design combinational logic and sequential logic circuits

3. Circuit Building

Standards:

- Students will develop the ability to use symbols, measurements and schematics to build, test and troubleshoot electronic circuits and systems.
- Construct and measure a basic circuit using electronic components.
- Demonstrate safe and appropriate use of tools, machines and materials in electronics technology.

Essential Question:

Students will be able to answer the question(s):

- How does a circuit work to solve a defined problem?
- How are electronics made with today's technology?

Essential Knowledge:

- The student will be able to distinguish between through-hole and surface-mounted circuits
- The student will be able to build a circuit given a circuit schematic
- The student will troubleshoot and repair a nonfunctioning circuit

4. Energy Sources

Standards:

- Discuss, analyze and use energy systems.

- Analyze, use and discuss machine and tool use relating to energy and power systems.
- Identify and analyze responsible and efficient management of energy resources.
- Develop necessary skills in problem solving for future energy systems.
- Categorize how energy can be grouped into major forms: thermal, radiant, electrical, mechanical, chemical, nuclear and others.

Essential Question:

Students will be able to answer the question(s):

- What kinds of energy are available in today's world?

Essential Knowledge:

- The student will recognize and be able to define what an energy source is, the types of energy sources and how we implement those sources

5. Wind Energy

Standards:

- Discuss, analyze and use energy systems.
- Analyze the role of the entrepreneur in America's businesses today
- Identify and collect information about everyday problems that can be solved by technology and generate ideas and requirements for solving a problem.
- Categorize how energy can be grouped into major forms: thermal, radiant, electrical, mechanical, chemical, nuclear and others.
- Identify tools used in energy systems.
- Follow safe procedures when using tools and equipment related to power and energy systems.

Essential Question:

Students will be able to answer the question(s):

- Why is wind energy a popular alternative energy source?

Essential Knowledge:

- The student will explain and research the traits, advantages & disadvantages of wind energy
- The student will construct a model to test the efficiency of wind energy

6. Mechanical Energy

Standards:

- Students will communicate and collaborate with others to accomplish tasks and develop solutions to problems and opportunities.
- Discuss, analyze and use energy systems.

- Identify and collect information about everyday problems that can be solved by technology and generate ideas and requirements for solving a problem.
- Categorize how energy can be grouped into major forms: thermal, radiant, electrical, mechanical, chemical, nuclear and others.
- Identify tools used in energy systems.
- Follow safe procedures when using tools and equipment related to power and energy systems.

Essential Question:

Students will be able to answer the question(s):

- What are the mechanical forms of energy we use?
- What are the types of machines we use to make our lives easier?

Essential Knowledge:

- The student will be able to determine the type of mechanical energy given a scenario and how to calculate its efficiency
- The student will identify the six simple machines and how they manipulate energy
- The student will define what work is
- The student will define what power is
- The student will communicate essential concepts and ideas about energy to his/her peers
- The student will construct a machine to perform a mechanical task

