

To: USD 261 BOE and Dr. Burke

From: Brett Marrs- Industrial Tech. Department Head

Re: Energy Pathway

Date: November 13, 2018

History/Relevance: This pathway would develop our students to get experience and learn about the energy occupation. This pathway would take a student from conventional energy to green energy. This occupation has been on the upswing in Kansas due to all the wind farms and the push for green energy. I have questioned former students that are in the field and they stated that they would have benefited from these classes.

What: We are asking for approval to create an energy pathway. This pathway consists of Introduction to Energy, Energy Industry Fundamentals, and Research and Design for Energy Comprehensive.

Why: These classes would help our students that are wanting to go into this career path get experience of what occupations there are. Also this gives our students another avenue to make connection in the field of energy with business professional coming into speak and working with a company partner completing the technical level class.

Where: Campus High School

When: This will begin in the 2019-2020 school year.

How: Once classes are approved we will start putting them into our curriculum guide, purchase materials and make them available for students to take.

Who: The intro class can be taught by current staff. In order to teach the upper division classes, we will need to hire another instructor to teach them.

How much: the cost for these classes would be textbooks, and material for in class projects.

If you have any questions, please contact me at bmarrs@usd261.com or 554-2236.

Thank you for your consideration!

New Course Proposal

Proposed Course Name: introduction to Energy

School: Campus High School

Target Audience: Freshman, Sophomore

Career Pathway (If applicable): Engineering

Funded Course: Yes

Dual Credit: No

Kansas Course Code: 41100

Course Length: Semester or ½ Year

Credits: .5

Prerequisite: None

Purpose: Creating Energy Pathway

Justified Need: Yes

Course Description: This is an introductory class into the Energy pathway. Students will learn the basics in the Energy field, electrical, simple machines and conclude with basic skills required for those occupations.

Expenditures: Class books and materials for projects

Any Additional Documentation (if needed):

41100 Introduction to Energy

(.5 credit) Required for Pathway approval. An Introductory course designed to teach students about the occupations in the Energy field and the skills required for those occupations.

3 2 1 0 1. Understand the concepts of energy.

- a. forms of energy & how energy can perform work.
- b. differentiate between potential energy and kinetic energy.
- c. how energy can be transformed.

3 2 1 0 2. Understand how humans utilize energy.

- a. what types of energy is used by humans.
- b. how humans have historically used energy.
- c. how energy use has changed over time.
- d. how new forms of renewable and alternative energy sources may be used in the future.

3 2 1 0 3. Demonstrate an ability to understand and interpret data as it relates to energy

- a. read graphs and charts to analyze data and to communicate information.
- b. how data can be used to understand and create opportunities around energy.
- c. how computers, data, analytics, and machine learning can be used to optimize energy generation and consumption.

3 2 1 0 4. Understand what careers are available in the energy field.

3 2 1 0 5. Understand how energy is generated and distributed to where it can be used.

- a. types of power generation.
- b. electrical power distribution lines.
- c. natural gas, water and sewer distribution.
- d. how energy is metered and billed.

3 2 1 0 6. Understand how energy is used in a building.

- e. Building envelope.
- f. Lighting systems.
- g. Heating, cooling, and ventilation.

- h. Water consumption.
 - i. Other
- 3 2 1 0 7. Perform an energy audit in a building.
- a. Conduct energy use benchmarking using historical energy consumption.
 - b. Identify equipment, systems and processes that use energy in a building.
 - c. Identify the factors that impact energy use in a building.
- 3 2 1 0 8. Identify opportunities to optimize energy use in a building.
- a. use energy audit to identify existing energy use.
 - b. utilize building data to identify opportunities for energy optimization.
 - c. calculate the cost and other impacts of optimized energy use.
- 3 2 1 0 9. Present findings and recommendations from energy audit.
- a. create visual aids.
 - b. Oral presentation to school district personnel and/or community members.

New Course Proposal

Proposed Course Name: Energy Industry Fundamentals

School: Campus High School

Target Audience: Sophomore, Juniors, Seniors

Career Pathway (If applicable): Energy (ENGINEERING CAREER CLUSTER)

Funded Course: Yes

Dual Credit: possible

Kansas Course Code: 41105

Course Length: 2 Semester or Year

Credits: 1

Prerequisite: introduction to energy

Purpose: Creating Energy Pathway

Justified Need: Yes

Course Description: This is an introductory class into the Energy pathway. Students will learn about the Energy jobs and conclude with the skills required for those occupations.

Expenditures: Class books and materials for projects

Any Additional Documentation (if needed):

41105 – Energy Industry Fundamentals (1 credit)

3 2 1 0 1. Foundational Science and Engineering Concepts

3 2 1 0 2. Is able to describe the power generation delivery grid system from generation to end user including VARS (Vertical and Azimuth Reference System)

3 2 1 0 3. Describes wind energy and the way it is harnessed

3 2 1 0 4. Defines kinetic energy

3 2 1 0 5. Lists and describes the topography and weather patterns of states that effectively harness wind

3 2 1 0 6. Explains hydraulics (brakes and/or blade/tip pitching)

3 2 1 0 7. Comprehends gearing, fasteners, torquing, and lubrication (oils and greases)

3 2 1 0 8. Comprehends how Material Safety Data Sheets (MSDS) are utilized

- 3 2 1 0 9. Has a basic understanding of aviation terminology and basic aerodynamics (physics)
- 3 2 1 0 10. Is knowledgeable in instrumentation and controls logic theory
- 3 2 1 0 11. Has a basic understanding of fiber optics
- 3 2 1 0 12. Has an understanding of basic rigging
- 3 2 1 0 13. Is knowledgeable in wind turbine concepts such as: Statics dynamics, Thermodynamics, & Basic Meteorology

SOLAR TECHNICIANS

- 3 2 1 0 14. Describes solar energy and how it is harnessed
- 3 2 1 0 15. Explains the differences between passive solar and active solar
- 3 2 1 0 16. Is able to diagram PhotoVoltaic cells (e.g. array, panel, module and boron-enriched silicon)
- 3 2 1 0 17. Describes a central receiver system
- 3 2 1 0 18. Identifies parts of a solar plant

BIOMASS AND BIOFUELS TECHNICIANS

- 3 2 1 0 19. Discusses the major sources of biomass
- 3 2 1 0 20. Defines biofuels (e.g. ethanol, biodiesel and methanol)
- 3 2 1 0 21. Outlines the pyramid of energy flow, including the different trophic levels
- 3 2 1 0 22. Describes the major sources, scale and impacts of biomass energy
- 3 2 1 0 23. Measures and monitors raw biomass feedstock, including wood, waste or refuse materials

GEOTHERMAL TECHNICIANS

- 3 2 1 0 24. Defines geothermal
- 3 2 1 0 25. Identifies how geothermal energy can be used for generation
- 3 2 1 0 26. Explains the process used for Geothermal Heat Pumps (GHP) and geoexchange
- 3 2 1 0 27. Identifies and corrects malfunctions of geothermal plant equipment, electrical systems, instrumentation or controls
- 3 2 1 0 28. Calculates heat loss and heat gain factors for residential properties to determine heating and cooling required by installed geothermal systems
- 3 2 1 0 29. Designs and lays out geothermal heat systems according to property characteristics, heating and cooling requirements, piping and equipment requirements, applicable regulations or other factors
- 3 2 1 0 30. Determines the type of geothermal loop system most suitable to a specific property and its heating and cooling requirements

HYDROPOWER AND MARINE ENERGY TECHNICIANS

- 3 2 1 0 31. Defines hydropower
- 3 2 1 0 32. Explains how hydropower works
- 3 2 1 0 33. Describes ways that hydropower can be utilized without harming fish and wildlife
- 3 2 1 0 34. Defines marine energy
- 3 2 1 0 35. Explains how marine energy works

GAS TRANSMISSION AND DISTRIBUTION

- 3 2 1 0 36. Complies with the procedures necessary to ensure a safe and healthy work environment
- 3 2 1 0 37. Lays out, assembles, installs and maintains pipe systems and pipe supports for use in the transmission and distribution of natural gas
- 3 2 1 0 38. Reads, understands and creates basic prints used in the design, operation and maintenance of gas networks including engineering drawings, diagrams and schematics
- 3 2 1 0 39. Inspects service lines and house lines, investigates leak fume complaints, restores and terminates gas service and performs pressure checks at customer's premises
- 3 2 1 0 40. Is able to use equipment to detect leaks both in a customer's premises or outdoors such as CGI gas scope leak machine and Gas Ranger

NUCLEAR GENERATION: Technical skills and knowledge necessary for nuclear power plant personnel reactor Theory and Operations:

- 3 2 1 0 41. Explains the general design overview of the basic reactor types
- 3 2 1 0 42. Demonstrates understanding of reactor startup and shutdown procedures
- 3 2 1 0 43. Explains the fission process including the construction of fission product barriers

New Course Proposal

Proposed Course Name: Research & Design for Energy Comprehensive

School: Campus High School

Target Audience: Juniors, Seniors

Career Pathway (If applicable): Energy (ENGINEERING CAREER CLUSTER)

Funded Course: Yes

Dual Credit: No

Kansas Course Code: 41260

Course Length: 2 Semester or Year

Credits: 1

Prerequisite: None

Purpose: Creating Energy Pathway

Justified Need: Yes

Course Description: An application level course which allows for more in-depth student research projects and/or workplace/internship experience related to the field of Energy.

Expenditures: Class books and materials for projects

Any Additional Documentation (if needed):

Research Element

3 2 1 0 1. Work with peers and instructor to determine an energy-related topic, project, or problem for research or design.

3 2 1 0 2. Identify the stakeholders who will be impacted by a project, and consider multiple points of view in the research/design process.

3 2 1 0 3. Access and utilize industry resources in the completion of the project.

3 2 1 0 4. Research new technologies that could affect the topic/project, and/or help solve the problem.

3 2 1 0 5. Demonstrate ability to manage and set project goals and timelines

3 2 1 0 6. Demonstrate abilities in design/planning, visual communication & problem solving in the energy industry

3 2 1 0 7. Demonstrate an awareness of current energy industry standards

3 2 1 0 8. Use appropriate grammar and word usage in the creation and implementation of a formal graphic presentation using current standards and technology

Workplace Element

Research Element

3 2 1 0 1. Work with peers and instructor to determine an energy-related topic, project, or problem for research or design.

3 2 1 0 2. Identify the stakeholders who will be impacted by a project, and consider multiple points of view in the research/design process.

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Workplace Element