Introduction to Energy, Power, and Transportation Systems

Course Description

This introductory course will provide the students with entry level knowledge and skills for further study in the Energy, Power and Transportation (EPT) cluster. The six forms of energy, power transmission, and modes of transportation will be introduced with several activities. A special emphasis will be placed on basic electricity and electronic theory and operation. Measurement system used in EPT will also be included in this foundation course.

Course Code:

Program(s) of Study to which This Course Applies

- Mobile Equipment Maintenance

Course Framework	Reference Standards	Academic Crosswalk
Standard 1. Students will explore and present information on a selected career in the Automotive or Mobile Equipment Repair Industry.		
Benchmark 1.1 The student will research into various careers. <u>Sample performance indicators:</u> • Prepare a 1-2 page paper. • Use a rubric evaluation.		LA12.1.5.b (1) LA12.1.6.d (1) LA12.1.6.f (1) LA12.2.1.f (1) LA12.2.2.a (1) LA12.2.2.b (1) LA12.2.2.c (1) LA12.3.1.a (1) LA12.3.1.c (1)
Benchmark 1.2 The student will use the internet, guidance counselor, job shadow, and college visits to explore careers. <u>Sample performance indicators:</u>	CAPS/COPE NCE	LA12.1.5.b (1) LA12.1.6.d (1) LA12.1.6.f (1) LA12.2.1.f (1)

• Take a personal interest inventory. • Visit colleges of interest.		LA12.2.2.a (1) LA12.2.2.b (1) LA12.2.2.c (1) LA12.3.1.a (1) LA12.3.1.c (1)
Standard 2. Students will understand the importance of health, safety, and environmental management systems in organizations and their importance to organizational performance and regulatory compliance.	TRC206	
Benchmark 2.1 The student will follow all personal safety procedures and OSHA regulations. <u>Sample performance indicators:</u> • Practice wearing safety gear. • Adhere to MSDS guidelines.	OSHA, MSDS	SC12.1.1.d (2) LA12.1.5.b (1) LA12.1.6.d (1) LA12.1.6.f (1)
Benchmark 2.2 The student will follow all safety procedures while operating tools and equipment. <u>Sample performance indicators:</u> • Practice safe use of tools and equipment. • Comply with environment regulations and disposal.	OSHA, MSDS EPA	SC12.1.1.d (2) LA12.1.6.d (1) LA12.1.6.f (1)
Standard 3. Students will choose and calculate math formulas used to find, identify, and know how to use measurement systems and safety in the Transportation Industry.		
Benchmark 3.1 The student will understand USC and metric measurement systems. <u>Sample performance indicators:</u> • Understand USC and metric measurement systems. • Perform measurements with a feeler gauge. • Accurately measure components with an outside micrometer. • Perform accurate measurements with a dial indicator.	ATGST NCTM	SC12.1.1.l (1) MA12.2.5 (1) LA12.1.5.b (1) LA12.1.6.d (1) LA12.1.6.f (1)
Benchmark 3.2 The student will demonstrate the proper use of basic lab safety rules.	ATGST	LA12.1.5.b (1) LA12.1.6.d (1)

Sample performance indicators: • Understand the reasons for developing a personal shop safety plan. • List potential shop safety hazards. • Know basis shop safety rules. • List steps to maintain air quality in the shop. • Know where to find MSDS sheets and why they are important.		LA12.1.6.f (1)
Standard 4. Students will understand Electrical Power Systems and Electronics.		
Benchmark 4.1 The student will understand and apply Electrical systems. Sample performance indicators: • List the types of current and explain how they are produced. • State how electrical power is measured. • Name different types of electrical circuits and give examples of their uses. • Identify how electricity and magnetism are related. • Identify the types of electrical circuits used in transportation vehicles.	EPTT	MA12.3.3 (1) CCSS: MA(A-CED) (1) LA12.1.5.b (1) LA12.1.6.d (1) LA12.1.6.f (1) LA12.2.2.c (1)
Benchmark 4.2 The student will identify electronic devices and explain electronic circuits. Sample performance indicators: • Identify the values for resistors based on the resistor color code. • State the purpose of using capacitors in conjunction with resistors for timing functions. • Recognize the purposes of common electronic components, including resistors, capacitors, transistors, and diodes.	EPTT	LA12.1.5.b (1) LA12.1.6.d (1) LA12.1.6.f (1) LA12.2.2.c (1)
Standard 5. Students will understand the different Modes of Transportation.		
Benchmark 5.1 The student will research the modes of transportation. Sample performance indicators: • Define a transportation system. • List the five types of transportation systems. • Name several transportation system inputs. • Recognize several transportation system processes.	EPTT	LA12.1.5.b (1) LA12.1.6.d (1) LA12.1.6.f (1) LA12.2.2.c (1)

• State the expected output of a transportation system. • Identify the types of goals that affect a transportation system.		
Standard 6. Students will identify and distinguish the forms of energy and power transmission.		
Benchmark 6.1 The student will recognize the different forms of energy. <u>Sample performance indicators:</u> • Identify types of energy surrounding us. • Differentiate among renewable, nonrenewable, and inexhaustible energy sources. • Explain the difference between potential and kinetic energy. • Name and describe the six forms of energy.	EPTT	SC12.2.3.j (1) LA12.1.5.b (1) LA12.1.6.d (1) LA12.1.6.f (1) LA12.2.2.c (1)
Benchmark 6.2 The students will understand how the power transmission operates. <u>Sample performance indicators:</u> • List the six simple machines and give an example of each. • List three types of gears. • Name the two primary characteristics of power. • Identify two mechanical transmission devices and describe how each operates. • Define mechanical advantage and give an example. • Recognize the difference between ideal mechanical advantage (IMA) and actual mechanical advantage (AMA).	EPTT	LA12.1.5.b (1) LA12.1.6.d (1) LA12.1.6.f (1) LA12.2.2.c (1)
Benchmark 6.3 The student will identify devices that convert one form of energy or power to another form of energy or power. <u>Sample performance indicators:</u> • List the types of energy and power conversions that can occur. • Identify devices used to convert various forms of energy or power into other forms of energy or power. • Describe the operation of devices used to convert various forms of energy or power into other forms of energy or power.	EPTT	SC12.2.3.i (1) LA12.1.5.b (1) LA12.1.6.d (1) LA12.1.6.f (1) LA12.2.2.c (1)
Standard 7. Students will understand the operation of the Internal Combustion Engine (ICE).		

Benchmark 7.1 The student will explain the operation of the internal combustion engine. <u>Sample performance indicators:</u> • Describe the operation of devices used to convert various forms of energy or power into other forms of energy or power. • Recognize the basic process by which two-stroke engines and four-stroke gasoline engines operate. • Select the correct tool for a specific application. • Accurately read a micrometer.	EPTT	MA12.2.5 (1) LA12.1.5.b (1) LA12.1.6.d (1) LA12.1.6.f (1) LA12.2.2.c (1)
Standard 8 Students will define intermodal transportation.		
Benchmark 8.1 The student will utilize previous knowledge and skills to produce an intermodal transportation model. <u>Sample performance indicators:</u> • Identify the importance of containerization. • List and discuss the advantages of intermodal transportation. • Define passenger and cargo intermodal transportation. • Describe legislation and government agencies that control intermodal transportation. • Plan an intermodal shipping route.	EPTT	LA12.1.5.b (1) LA12.1.6.d (1) LA12.1.6.f (1) LA12.2.2.c (1)

Reference Standards Sources

- KS = Career Clusters Knowledge and Skills Statements. Revised 2008. National Career and Technical Education Foundation, Silver Spring, MD. www.careerclusters.org.
- NATEF = National Automotive Technician Education Foundation 2008 Task List
- MSDS = Material Safety Data Sheet
- OSHA = Occupational Safety and Health Administration
- EPA = Environmental Protection Agency
- TRC = Transportation Research Center
- TCC = The Car Care Book by Ron Haefner
- ATGST = Automotive Technology General Service Technician
- SE = Small Engines by R. Bruce Radcliff
- NCTM = Nebraska Council Teaching Math
- EPTT = Energy, Power, and Transportation Technology by Len S. Litowitz and Ryan A. Brown

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Other Information

Suggestions for innovative teaching and learning strategies:	•
Related assessments:	•
Extended learning opportunities:	•