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PRINCIPLES OF TECHNOLOGY III

Industrial Technology **11-12**

Curriculum Standard One: **The student will demonstrate his/her ability to solve problems and apply technical solutions in mechanical, fluid, electrical and thermal systems as they relate to transducers.**

Performance Objective	Critical Attributes	Benchmarks/Assessment
1. The student will define, describe the action of, and identify transducers in general.	A. Can the student explain the use of transducers in industry as opposed to energy transformers?	• The student will correctly differentiate between a transducer and energy transformer.
2. The student will assemble, run, and analyze various mechanicals to electrical transducers.	A. Can the student follow a schematic and set up a mechanical force transducer?	• Given a schematic and written instructions, the student will correctly set up, troubleshoot, and run a transducer such as a strain gage, accelerometer, and microphone. • The student will use appropriate equations to analyze experimental results.
3. The student will assemble, run, and analyze various fluids to mechanical or electrical transducers.	A. Can the student follow a schematic and set up a fluid to mechanical or electrical transducer?	• Given a schematic and written instructions, the student will correctly set up, troubleshoot, and run a transducer, such as a turbine flowmeter, bourdon tube, or rotometer. • The student will use appropriate equations to analyze experimental results.

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Performance Objective	Critical Attributes	Benchmarks/Assessment
4. The student will assemble, run, and analyze various electrical to mechanical or thermal transducers.	A. Can the student follow a schematic and set up a fluid to mechanical or electrical transducer?	• The student will explain the functioning of an ammeter and voltmeter and explain why they are transducers.
5. The student will assemble, run, and analyze various thermals to mechanical, fluid, or electrical transducers.	A. Can the student follow a schematic and set up a fluid to mechanical or electrical transducer?	• Given a schematic and written instructions, the student will correctly set up, troubleshoot, and run a transducer, such as a thermistor, thermocouple, and bimetallic strip. • The student will use appropriate equations to analyze experimental results.

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PRINCIPLES OF TECHNOLOGY III

Industrial Technology **11-12**

Curriculum Standard Two: **The student will demonstrate his/her ability to solve problems, perform in labs, and apply technical solutions in systems as they relate to radiation.**

Performance Objective	Critical Attributes	Benchmarks/Assessment
1. The student will learn the characteristics and applications of electromagnetic radiation.	A. Can the student explain the spectrum of electromagnetic radiation, including infrared, radio waves, microwaves, etc.?	• The student will accurately label the EM spectrum.
	B. Can the student identify the four characteristics of EM radiation (e.g., wavelength, speed, frequency, and energy)?	• The student will define a specific band of EM radiation in terms of wavelength.
	C. Can the student describe the photon and its energy levels?	• The student will discuss the relationship of the photon's energy and its wavelength.
	D. Can the student solve problems for speed and energy of EM radiation?	• Given the energy of a particular photon of light, the student will determine its frequency and wavelength.

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Performance Objective	Critical Attributes	Benchmarks/Assessment
2. The student will learn the characteristics and applications of nuclear radiation.	A. Can the student identify the three main components of nuclear radiation?	• The student will define and discuss alpha particles, beta particles, and gamma rays.
	B. Can the student define basic terms used to describe nuclear particles and reactions?	• The student will define terms, such as isotope, nuclide, and atomic number.
	C. Can the student discuss industry applications and safety concerns with nuclear reactions?	• The student will contrast fusion and fission.
	D. Can the student identify nuclear reactions?	• The student will determine beam spread of a helium-neon laser.
	E. Can the student operate a low-power, helium-neon laser safely?	

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Curriculum Standard Three: **The student will demonstrate his/her ability to solve problems and apply technical solutions in light and optical systems.**

Performance Objective	Critical Attributes	Benchmarks/Assessment
1. The student will demonstrate an understanding of ray optics.	A. Can the student discuss reflection and refraction in optics?	• The student will use light rays in a drawing to show how light is reflected from plane mirrors. • The student will use light rays in a drawing to show how light is reflected from spherical mirrors. • The student will explain the concept "index of refraction." • The student will explain what is meant by the size and focal length of a lens. • The student will distinguish between convex and concave lenses.
2. The student will describe characteristics of wave optics.	A. Can the student define and identify characteristics of interference and diffraction?	• The student will contrast constructive and destructive interference • The student will explain interference fringes. • The student will identify workplace applications where technicians use interference of light. • The student will explain the design, effect, and use of a diffraction grating.

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Performance Objective	Critical Attributes	Benchmarks/Assessment
3. The student will become proficient in basic laser technology.	A. Can the student describe the design, safety, power supply, and function of a laser?	• The student will draw a simple block diagram of a laser. • The student will discuss four ways to energize a laser.
	B. Can the student solve laser problems that involve radiant power?	• The student will define the term "coherent light."
	C. Can the student solve laser problems that involve power density?	• The student will explain why lasers can produce extremely high power densities on targets.
4. The student will become proficient in optical systems.	A. Can the student use graphical techniques to solve optical problems?	• The student will locate images formed by two lenses through graphical analysis.
	B. Can the student describe the optical reasons for such conditions, such as nearsighted or farsighted vision?	• The student will diagram the effect of corrective lenses on vision.
	C. Can the student describe industry applications of lasers?	• The student will describe a laser system that can be used for welding.

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Curriculum Standard Four: **The student will demonstrate an ability to solve problems and apply technical solutions to systems as they relate to time constants.**

Performance Objective	Critical Attributes	Benchmarks/Assessment
1. The student will identify and analyze time constants in mechanical and fluid systems.	A. Can the student distinguish between uniform change and non-uniform change?	• The student will draw a curve that shows a linear increase or decrease of a variable with time.
	B. Can the student give examples of time constants in mechanical and fluid systems?	• The student will draw a curve that shows an exponential increase or decrease of a variable with time. • Given the equation that describes how fast a vibration is slowing down (damped oscillation), the student will identify the time constant.
	C. Can the student identify workplace applications where technicians measure and control time constants?	• The student will list workplace applications of both mechanical and fluid time constants.
2. The student will identify and analyze time constants in electrical and thermal systems.	A. Can the student identify energy discharge curves?	• The student will determine the curve that shows how voltage increases with time while charging a capacitor.

Performance Objective	Critical Attributes	Benchmarks/Assessment
	B. Can the student describe the time constant as it applies to an inductor?	• Given the equation that describes the increase in current through an inductor when a switch is closed, the student will identify the 1/e time constant and predict the time it takes for the current to reach 99% of its final value.
	C. Can the student describe the loss of energy in a thermal system through the use of time constants?	• The student will explain why it is important to know the time constant of a thermocouple.
	D. Can the student identify workplace applications in electrical and thermal systems where technicians measure or control time constants?	• The student will describe a workplace application where technicians measure and control time constants.