PRINCIPLES OF TECHNOLOGY I

Industrial Technology **10-12**

Curriculum Standard One: **The student will demonstrate his/her ability to solve problems and apply technical solutions to mechanical systems, both linear and angular, as they relate to force, torque, work, efficiency, friction, drag, potential, and kinetic energy, and power.**

Performance Objective	Critical Attributes	Benchmarks/Assessment
1. The student will examine force as it applies to both linear and angular mechanical systems.	A. Can the student select appropriate equations and input experimental data to solve force problems?	• The student will measure force with 2% tolerance. • The student will calculate torque within 2% tolerances.
2. The student will learn how to analyze force problems through the use of vectors.	A. Can the student use a graphics approach to solving vector problems?	• The student will accurately solve vectoral problems through graphic analysis.
3. The student will study the concepts of work and efficiency as one way to look at energy flow in a system.	A. Can the student determine efficiency of a system?	• Given a system, such as a motor driven pulley, the student will collect experimental data, calculate work in and work out, and determine efficiency.
4. The student will examine velocity and acceleration in both angular and linear systems.	A. Can the student measure velocity and acceleration in linear systems? B. Can the student measure velocity and acceleration in angular systems?	• The student will correctly determine both velocity and acceleration in either angular or linear systems in an experimental setting.

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Performance Objective	Critical Attributes	Benchmarks/Assessment
5. The student will examine both kinetic and potential energy as it applies to mechanical and fluid systems.	A. Can the student determine potential and kinetic energy within a system?	• Using the equations $E_p = wh$ and $E_p = 1/2\ kd^2$, the student will correctly calculate potential energy in a system. • Using the equations $E_k = 1/2\ mr^2$ and $E_k = 1/2I\omega^2$, the student will accurately calculate kinet energy in a system.

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Curriculum Standard Two: **The student will demonstrate his/her ability to solve problems and apply technical solutions in both hydraulic and pneumatic fluid systems as they relate to pressure, density, fluid work, accumulators, fluid resistance, flow rate, kinetic and potential energy, and power.**

Performance Objective	Critical Attributes	Benchmarks/Assessment
1. The student will solve problems in fluid systems in such areas as work, efficiency, flow rate, energy, and power.	A. Can the student select appropriate equations and input data to solve fluid problems?	• Given a problem in fluid work, the student will calculate work in, work out, and efficiency.
2. The student will assemble, run, and analyze fluid systems.	A. Can the student follow a schematic and set up a fluid system that holds pressure?	• Given a schematic and written instructions, the student will correctly set up, troubleshoot, and run a fluid lab. • The student will use appropriate equations to analyze experimental results.
3. The student will learn various sources of resistance in fluid systems.	A. Can the student identify sources of resistance in a fluid system?	• The student will examine a fluid system, identify sources of resistance, and recommend changes to lower resistance in the system.
4. The student will learn the function and result of adding an accumulator to a fluid system.	A. Can the student identify the effects of an accumulator in a fluid system on energy flow?	• Given a fluid system, the student will identify the appropriate place to add an accumulator and predict its effect on energy flow.

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Curriculum Standard Three: **The student will demonstrate his/her ability to solve problems and apply technical solutions in electrical systems as they relate to voltage, electrical work, efficiency, amperage, charge, resistance, inductance, parallel and series circuitry, capacitance, and electrical power.**

Performance Objective	Critical Attributes	Benchmarks/Assessment
1. The student will learn about various electrical factors including voltage, amperage, resistance, wattage, capacitance, and inductance.	A. Can the student clearly explain the concepts of voltage, amperage, and resistance through analogy and example?	• The student will contrast voltage, amperage, and resistance.
2. The student will learn to mathematically analyze series and parallel circuits.	A. Can the student apply Ohm's Law and relationships of series and parallel circuits to analyze and predict values?	• Given an electrical circuit and some known values, the student will use Ohm' Law to predict other values.
3. The student will learn to assemble and troubleshoot electrical circuits, including instrumentation from schematics.	A. Can the student correctly assemble circuits?	• The student will correctly assemble a circuit using a power source, multiple loads, a control device, and a voltmeter and ammeter.
4. The student will learn to contrast parallel and series circuits.	A. Can the student list distinguishing characteristics of parallel and series circuits?	• The student will list the equations describing voltage, amperage, and resistance with series and parallel circuits.
5. The student will learn to evaluate electrical work and efficiency.	A. Can the student calculate efficiency and work in electrical labs?	• The student will calculate efficiency of an electrical motor within 5% of actual value from an electrical lab.

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Curriculum Standard Four: **The student will demonstrate his/her ability to solve problems and apply technical solutions in thermal systems as they relate to heat flow rate, thermal conductors and insulators, transference of heat energy, specific heat, and efficiency.**

Performance Objective	Critical Attributes	Benchmarks/Assessment
1. The student will correctly apply equations to real life problems in thermal energy transference.	A. Can the student solve heat flow problems?	• The student will solve a heat flow problem across an interface by using the equation: $\underline{H = kA\Delta T}$
2. The student will learn characteristics and uses of thermal conductors and insulators.	A. Can the student analyze the effects of thermal conductors and insulators?	• The student will analyze the rate of heat flow through an interface.
3. The student will learn the concept of specific heat.	A. Can the student understand that specific heat affects temperature changes in a substance?	• The student will correctly analyze temperature changes when heat energy is added or subtracted from an object by using the equation: $\underline{H = mc\Delta T}$

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Curriculum Standard Five: **The student will demonstrate competency in measurement skills developed throughout the course through accurately using such equipment as multimenters, oscilloscopes, thermocouples, manometers, and calipers.**

Performance Objective	Critical Attributes	Benchmarks/Assessment
1. The student will correctly use a digital multimeter.	A. Can the student measure voltage, amperage, and resistance with a digital multimeter?	• The student will correctly measure DC voltage across a load by using a digital multimeter.
2. The student will correctly use an analog multimeter.	A. Can the student measure voltage, amperage, and resistance with an analog multimeter?	• The student will correctly measure DC amperage in a circuit by using an analog multimeter.
3. The student will correctly use both a slant-tube and U-tube manometer.	A. Can the student correctly measure both low and high pressure differences with a manometer?	• The student will measure a pressure difference to the nearest 0.1psi by using a slant tube manometer.
4. The student will accurately use a single junction thermocouple.	A. Can the student correctly use a thermocouple?	• The student will correctly measure temperature to the nearest 1C° by using a thermocouple and calibration table.
5. The student will accurately set up and adjust an oscilloscope to obtain a clear signal.	A. Can the student correctly use an oscilloscope to measure voltage and period?	• The student will determine period and voltage of an AC circuit by correctly using an oscilloscope.