

Principles of Technology 1 (9811)

UNIT 1: FORCE PT1.1

- 1 Differentiate between scalar and vector. PT1.1.1
- 2 Define force in general and in the context of mechanical, fluid, electrical, and thermal systems. PT1.1.2
- 3 Give examples of complex technological devices where force must be controlled, measured, or applied. PT1.1.3
- 4 Calculate force, pressure, voltage, and temperature difference. PT1.1.4
- 5 Predict what happens to an object when forces on it are balanced and when forces on it are unbalanced. PT1.1.5
- 6 Measure force in mechanical, fluid, electrical, and thermal systems. PT1.1.6
- 7 Research occupations that require technicians to measure, control, or otherwise deal with force in complex devices. PT1.1.7

UNIT 2: WORK PT1.2

- 1 Define work in general and in mechanical, fluid, and electrical systems. PT1.2.1
- 2 Compare the presence of force and movement in mechanical, fluid, and electrical systems. PT1.2.2
- 3 Identify the International System of Units (SI) and English units for work in mechanical, fluid, and electrical systems. PT1.2.3
- 4 Demonstrate the effects of work done in mechanical, fluid, and electrical systems. PT1.2.4
- 5 Measure work in mechanical, fluid, and electrical systems. PT1.2.5

UNIT 3: RATE PT1.3

- 1 Define rate in general and in mechanical, fluid, electrical, and thermal systems. PT1.3.1
- 2 Identify the SI and English units for rate in all four energy systems. PT1.3.2
- 3 Calculate rate in mechanical, fluid, electrical, and thermal systems. PT1.3.3

4 Research workplace applications where rate is measured and/or controlled. PT1.3.4

**UNIT 4:
RESISTANCE** PT1.4

1 Define resistance in general and in mechanical, fluid, electrical, and thermal energy systems. PT1.4.1

2 Calculate resistance in each energy system relating to the unifying principle of a “force” divided by a rate. PT1.4.2

3 Identify the SI and English units for resistance in each energy system. PT1.4.3

4 Compare positive and negative effects of resistance in each energy system. PT1.4.4

5 Explain workplace applications where technicians measure or control resistance. PT1.4.5

6 Describe how resistance is affected in thermal systems at extremely high and low temperatures in materials, including superconductors. PT1.4.6

7 Measure resistance in mechanical, fluid, electrical, and thermal energy systems PT1.4.7

8 Construct a system that demonstrates positive vs. negative effects of resistance. PT1.4.8

UNIT 5: ENERGY PT1.5

1 Define energy in mechanical, fluid, electrical, and thermal systems. PT1.5.1

2 Demonstrate potential energy. PT1.5.2

3 Demonstrate kinetic energy. PT1.5.3

4 Describe the relationship between the law of conservation of energy and potential energy, kinetic energy, and heat energy. PT1.5.4

5 Interpret types of energy conversion in mechanical, thermal, electrical, and fluid systems. PT1.5.5

6 Describe the relationship between work and energy. PT1.5.6

7 Describe how principles of mechanics apply to celestial systems. PT1.5.7

8 Identify the SI and English units for energy in each system. PT1.5.8

9 Calculate energy in each energy system. PT1.5.9

10 Research workplaces where technicians measure or control energy. PT1.5.10

UNIT 6: POWER PT1.6

- 1 Define power in general and in mechanical, fluid, electrical, and thermal systems.** PT1.6.1

- 2 Explain how thermal power and thermal rate are the same.** PT1.6.2

- 3 Explain how power in each energy system relates to the unifying principle of work divided by time.** PT1.6.3

- 4 Analyze why power can be described in terms of a force multiplied by a rate for mechanical, fluid, and electrical systems.** PT1.6.4

- 5 Research workplace applications where technicians measure or control power.** PT1.6.5

- 6 Construct a system that demonstrates the application of power.** PT1.6.6

UNIT 7: FORCE TRANSFORMERS PT1.7

- 1 Define force transformers in general and in mechanical, fluid, and electrical systems.** PT1.7.1

- 2 Evaluate the efficiency of energy conversion, using mathematical calculations.** PT1.7.2

- 3 Explain why force transformers form a unifying principle in mechanical, fluid, and electrical systems.** PT1.7.3

- 4 Research examples of force transformers in mechanical, fluid, and electrical systems.** PT1.7.4

- 5 Construct a system that demonstrates the application of force transformers.** PT1.7.5