WTCS Repository

10-806-137 Comprehensive Tech Physics

Course Outcome Summary

Course Information

Description The areas of mechanics, heat, electricity, magnetism and optics are covered through lecture, demonstration, and laboratory work. Empirical relationships are emphasized, incorporating mathematical prerequisites.

Total Credits 4.00

Pre/Corequisites

Prerequisite Each Wisconsin Technical College determines the General Education course prerequisites used by their academic institution. If prerequisites for a course are determined to be appropriate, the final Course Outcome Summary must identify the prerequisites approved for use by the individual Technical College.

Course Competencies

1. Analyze data (measurement devices)

Assessment Strategies

1.1. in laboratory reports, in recitations, in oral quizzing, and in correct responses to examination items

Criteria

Performance will be successful when:

1.1. learner collects, organizes and presents data
1.2. learner draws conclusions based on data
1.3. learner compares experimental results against theoretical predictions
1.4. learner interprets graphs

2. Perform dimensional analysis

Assessment Strategies

2.1. in laboratory reports, in recitations, in oral quizzing, and in correct responses to examination items

Criteria

Performance will be successful when:

2.1. learner relates physical quantity to its mathematical symbol and units (same system and different system) of measure
2.2. learner manipulates given units to desired units
2.3. learner checks for dimensional consistency on both sides of the equation

3. Solve vector problems

Assessment Strategies

3.1. in laboratory reports, in recitations, in oral quizzing, and in correct responses to examination items

Criteria

Performance will be successful when:

3.1. learner distinguishes between a vectory quantity and scalar quantity
3.2. learner composes vectors
3.3. learner decomposes vectors
3.4. learner adds vectors, both graphically and analytically

4. Evaluate linear motion

Assessment Strategies

4.1. in laboratory reports, in recitations, in oral quizzing, and in correct responses to examination items

Criteria

Performance will be successful when:

4.1. learner discriminates between the descriptors of linear motion
4.2. learner selects and sets up appropriate linear motions equation(s)
4.3. learner solves linear motion equations

5. Analyze force as it relates to linear motion

Assessment Strategies

5.1. in laboratory reports, in recitations, in oral quizzing, and in correct responses to examination items

Criteria

Performance will be successful when:

5.1. learner draws a free body diagram
5.2. learner selects and sets up appropriate Newton's law equation for linear motion problem
5.3. learner solves Newton's law equation

6. Analyze rotational motion

Assessment Strategies

6.1. in laboratory reports, in recitations, in oral quizzing, and in correct responses to examination items

Criteria

Performance will be successful when:

6.1. learner discriminates between the descriptors of rotational motion
6.2. learner selects and sets up appropriate rotational motion equation(s)
6.3. learner solves rotational motion equation(s)
6.4. learner applies centripetal force to circular motion problems

7. Analyze torque as it relates to rotational motion

Assessment Strategies

7.1. in laboratory reports, in recitations, in oral quizzing, and in correct responses to examination items

Criteria

Performance will be successful when:

7.1. learner draws a free body diagram
7.2. learner selects and sets up appropriate Newton's law equation for rotational motion problem
7.3. learner solves Newton's law equation

8. Evaluate momentum in a mechanical system

Assessment Strategies

8.1. in laboratory reports, in recitations, in oral quizzing, and in correct responses to examination items

Criteria

Performance will be successful when:

8.1. learner relates impulse and change in momentum to Newton's second law
8.2. learner applies the law of conservation of momentum to collisions

9. Evaluate energy in a mechanical system

Assessment Strategies

9.1. in laboratory reports, in recitations, in oral quizzing, and in correct responses to examination items

Criteria

Performance will be successful when:

9.1. learner relates energy and power to work
9.2. learner applies the law of conservation of energy
9.3. learner identifies examples of various forms of energy
9.4. learner classifies simple machines
9.5. learner calculates mechanical advantage and efficiency
9.6. learner relates power to efficiency

10. Analyze solids

Assessment Strategies

10.1. in laboratory reports, in recitations, in oral quizzing, and in correct responses to examination items

Criteria

Performance will be successful when:

10.1. learner identifies hardness, brittleness, ductility, and malleability
10.2. learner calculates stress
10.3. learner calculates strain
10.4. learner interprets stress/strain or elasticity diagram -- identifying ultimate strength of material, identifying breaking strength, and identifying elastic limit
10.5. learner calculates elasticity

11. Analyze fluids

Assessment Strategies

11.1. in laboratory reports, in recitations, in oral quizzing, and in correct responses to examination items

Criteria

Performance will be successful when:

11.1. learner identifies density, viscosity, surface tension, and capillary action
11.2. learner calculates static pressure at a location
11.3. learner determinates absolute, gauge, and atmospheric pressure in a fluid system
11.4. learner calculates buoyancy
11.5. learner calculates pressure difference in a closed system
11.6. learner calculates flow rate
11.7. learner calculates pressure head, velocity head, and elevation head
11.8. learner measures friction loss (i.e. pipes)
11.9. learner applies Bernoulli's equation to a system

12. Assess thermal properties of matter

Assessment Strategies

12.1. in laboratory reports, in recitations, in oral quizzing, and in correct responses to examination items

Criteria

Performance will be successful when:

12.1. learner calculates linear, area, and volume expansion in liquids and solids
12.2. learner calculates the thermal force with the expansion of solids
12.3. learner converts between Celsius and Fahrenheid and within absolute and relative temperature scales
12.4. learner calculates temperature, pressure, and volume from the ideal gas law

13. Assess heat

Assessment Strategies

13.1. in laboratory reports, in recitations, in oral quizzing, and in correct responses to examination items

Criteria

Performance will be successful when:

13.1. learner calculates heat transfer
13.2. learner sets up an equation of heat-gain or heat-loss which includes changes of heat quantity in matter going from the solid form below the freezing point to the gaseous form above the boiling point
13.3. learner calculates heat gain
13.4. learner calculates heat loss which includes phase changes within a phase and across phases

14. Analyze thermodynamic changes in a system

Assessment Strategies

14.1. in laboratory reports, in recitations, in oral quizzing, and in correct responses to examination items

Criteria

Performance will be successful when:

14.1. learner generates pressure/volume diagram
14.2. learner calculates the efficiency of a heat engine when the input and exhaust temperatures are known

15. Evaluate heat properties

Assessment Strategies

15.1. in laboratory reports, in recitations, in oral quizzing, and in correct responses to examination items

Criteria

Performance will be successful when:

15.1. learner calculates frequency, wave speed, and wavelength
15.2. learner calculates the wavelength or frequency of an electromagnetic wave
15.3. learner calculates the intensity of a sound wave
15.4. learner calculates the frequencies for sound waves in open and closed pipes
15.5. learner interprets constructive and destructive interference using the principle of superposition
15.6. learner calculates resonant frequencies

16. Analyze electricity

Assessment Strategies

16.1. in laboratory reports, in recitations, in oral quizzing, and in correct responses to examination items

Criteria

Performance will be successful when:

16.1. learner identifies type of electrostatic charge
16.2. learner calculates the force between two charged bodies
16.3. learner calculates capacitance based on circuit and physical parameters
16.4. learner calculates values of an electric field
16.5. learner interprets and calculates voltage values
16.6. learner calculates resistance based on circuit and physical paramters
16.7. learner verifies circuit using Kirchhoff's laws
16.8. learner calculates power

17. Analyze magnetism

Assessment Strategies

17.1. in laboratory reports, in recitations, in oral quizzing, and in correct responses to examination items

Criteria

Performance will be successful when:

17.1. learner analyzes magnetic fields
17.2. learner predicts the movement of a charged body in a magnetic field
17.3. learner calculates magnetic forces on moving charges
17.4. learner calculates magnetic field for current-carrying conductor for various geometries
17.5. learner calculates magnetic flux

17.6. learner calculates inductance based on physical and circuit parameters
17.7. learner describes the operation of AC/DC motor/generators
17.8. learner includes a vectoral representation of the circuit
17.9. learner includes RMS, effective, and peak voltage calculations

18. Evaluate light

Assessment Strategies

18.1. in laboratory reports, in recitations, in oral quizzing, and in correct responses to examination items

Criteria

Performance will be successful when:

18.1. learner identifies characteristics of the light (rectilinear propagation, reflection, refraction)
18.2. learner classifies light energy on the basis of frequency and wavelength
18.3. learner solves speed of light, frequency, and wavelength problems
18.4. learner calculates surface illumination
18.5. learner calculates the intensity of a light source
18.6. learner calculates luminous flux

19. Assess geometric optics

Assessment Strategies

19.1. in laboratory reports, in recitations, in oral quizzing, and in correct responses to examination items

Criteria

Performance will be successful when:

19.1. learner locates refracted images using ray diagrams
19.2. learner calculates refraction of light
19.3. learner calculates focal length using mirror equations
19.4. learner calculates focal length using lens equations
19.5. learner calculates magnification of mirrors and lenses
19.6. learner calculates the critical angle
19.7. learner calculates apparent depth

20. Evaluate the properties of the atom

Assessment Strategies

20.1. in laboratory reports, in recitations, in oral quizzing, and in correct responses to examination items

Criteria

Performance will be successful when:

20.1. learner includes a model drawing of an atomic structure
20.2. learner classifies atoms as metals or non-metals and as insulators, conductors, and semi-conductors
20.3. learner calculates emission wavelength based on energy level transitions
20.4. learner calculates half-life
20.5. learner describes the photoelectric effect and the reverse photoelectric effect
20.6. learner classifies reaction as a fission or fusion reaction