

WTCS Repository

10-806-187 Calculus Based Physics 1

Course Outcome Summary

Course Information

Description This course is designed to provide a calculus-based approach to the study of physics. Topics include: units and unit conversions, mechanics, rotational mechanics, work and energy, oscillations and waves.

Total Credits 3.00

Pre/Corequisites

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. Solve problems using vectors.

Assessment Strategies

- 1.1. through completion of homework
- 1.2. through completion of quizzes/exams
- 1.3. through completion of lab activities

Criteria

- 1.1. you describe the difference between a scalar and a vector
- 1.2. you can add two or more vectors
- 1.3. you can multiply a scalar and a vector
- 1.4. you can calculate a dot (scalar) product
- 1.5. you can calculate a cross (vector) product

2. Solve problems using kinematic equations

Assessment Strategies

- 2.1. through completion of homework
- 2.2. through completion of quizzes/exams
- 2.3. through completion of lab activities

Criteria

- 2.1. you can describe concepts of kinematics, including position, displacement, velocity, and acceleration
- 2.2. you can solve one, two, and three dimensional kinematic problems

3. Solve problems using Newton's Laws

Assessment Strategies

- 3.1. through completion of homework

- 3.2. through completion of quizzes/exams
- 3.3. through completion of lab activities

Criteria

- 3.1. you can define force
- 3.2. you can state Newton's 3 laws
- 3.3. you can draw a free body diagram
- 3.4. you can use Newton's Laws to solve problems

4. Calculate work and energy

Assessment Strategies

- 4.1. through completion of homework
- 4.2. through completion of quizzes/exams
- 4.3. through completion of lab activities

Criteria

- 4.1. you can calculate work done by constant and variable forces
- 4.2. you can describe the work-energy theorem
- 4.3. you can describe conservative and non-conservative forces
- 4.4. you can describe and calculate kinetic and potential energy

5. Solve problems using conservation of energy

Assessment Strategies

- 5.1. through completion of homework
- 5.2. through completion of quizzes/exams
- 5.3. through completion of lab activities

Criteria

- 5.1. you can describe conservation of energy
- 5.2. you solve problems using conservation of energy

6. Solve power problems

Assessment Strategies

- 6.1. through completion of homework
- 6.2. through completion of quizzes/exams
- 6.3. through completion of lab activities

Criteria

- 6.1. you can describe power
- 6.2. you can solve problems involving power

7. Solve momentum problems

Assessment Strategies

- 7.1. through completion of homework
- 7.2. through completion of quizzes/exams
- 7.3. through completion of lab activities

Criteria

- 7.1. you can describe momentum
- 7.2. you can describe the connection between momentum and impulse
- 7.3. you can describe conservation of momentum
- 7.4. you can solve problems involving momentum, including one and two dimensional collisions

8. Solve center of mass problems

Assessment Strategies

- 8.1. through completion of homework
- 8.2. through completion of quizzes/exams
- 8.3. through completion of lab activities

Criteria

- 8.1. you can describe center of mass

- 8.2. you can calculate the center of mass
- 8.3. you can solve problems involving center of mass

9. Solve problems using rotational kinematics

Assessment Strategies

- 9.1. through completion of homework
- 9.2. through completion of quizzes/exams
- 9.3. through completion of lab activities

Criteria

- 9.1. you can describe concepts of rotational kinematics, including angular position, angular displacement, angular velocity, and angular acceleration
- 9.2. you can compare linear and rotational variables
- 9.3. you can solve problems using rotational kinematics

10. Solve problems using torque

Assessment Strategies

- 10.1. through completion of homework
- 10.2. through completion of quizzes/exams
- 10.3. through completion of lab activities

Criteria

- 10.1. you can describe rotational moment of inertia
- 10.2. you can describe torque
- 10.3. you can calculate the moment of inertia
- 10.4. you can use the parallel axis theorem
- 10.5. you can solve problems involving torque

11. Solve problems using rotational energy

Assessment Strategies

- 11.1. through completion of homework
- 11.2. through completion of quizzes/exams
- 11.3. through completion of lab activities

Criteria

- 11.1. you can describe rotational kinetic energy
- 11.2. you can solve rotation problems using conservation of energy
- 11.3. you can solve rolling problems using conservation of energy

12. Solve problems using angular momentum

Assessment Strategies

- 12.1. through completion of homework
- 12.2. through completion of quizzes/exams
- 12.3. through completion of lab activities

Criteria

- 12.1. you can describe angular momentum
- 12.2. you can describe conservation of angular momentum
- 12.3. you can solve problems involving angular momentum

13. Solve simple harmonic motion problems

Assessment Strategies

- 13.1. through completion of homework
- 13.2. through completion of quizzes/exams
- 13.3. through completion of lab activities

Criteria

- 13.1. you can describe simple harmonic motion
- 13.2. you can calculate energy of a simple harmonic oscillator
- 13.3. you can describe resonance
- 13.4. you solve problems involving simple harmonic motion, including damping and forced oscillations

13.5. you can compare simple harmonic motion to uniform circular motion

14. Solve wave problems

Assessment Strategies

- 14.1. through completion of homework
- 14.2. through completion of quizzes/exams
- 14.3. through completion of lab activities

Criteria

- 14.1. you describe the difference between transverse and longitudinal waves
- 14.2. you can describe the properties of a wave including wavelength, frequency, period, speed, and amplitude
- 14.3. you can describe a traveling wave
- 14.4. you can calculate the energy transported by a wave
- 14.5. you can calculate problems involving waves

15. Solve problems using the superposition principle

Assessment Strategies

- 15.1. through completion of homework
- 15.2. through completion of quizzes/exams
- 15.3. through completion of lab activities

Criteria

- 15.1. you can describe the super position principle
- 15.2. you can add two waves
- 15.3. you describe beats
- 15.4. you can describe a standing wave
- 15.5. you can calculate the resonant frequency for waves on a string and waves in a tube - both open and closed ends
- 15.6. you can describe Fourier's theorem