

## WTCS Repository

# 10-806-187 Calculus Based Physics 1

## Course Outcome Summary

### Course Information

<b>Description</b>	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.
<b>Total Credits</b>	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