SYLLABUS FOR PHYSICS 109, INTRODUCTORY PHYSICS FOR THE LIFE SCIENCES

FALL TERM, 2010

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Office Hours will be posted.
PLEASE NOTE THAT ATTENDANCE OF THE FALL CONVOCATION (SEPTEMBER 23 FROM 10:30 TO NOON) IS EXPECTED OF ALL STUDENTS IN PHYSICS 109.

GOALS OF THE COURSE:

1) To help students develop a conceptual understanding of basic physical principles. Students often tend to focus on finding the correct equation to solve a problem. They fail to see that equations are simply consequences of concepts that express physical ideas. This course will emphasize how to apply a physical principle to obtain a qualitative solution to a problem. It will provide students with ways of "thinking through" problems before attempting to solve them numerically.
2) To help students understand that physics is an integrated body of knowledge, not simply a collection of isolated facts or topics. A concerted effort will be made to show that in physics, the big picture is one in which a small number of basic ideas are unified so as to present a coherent view of the physical world.
3) To show students that the principles of physics come into play time and time again in their lives. In short, physics is a study of the way nature behaves. This will be illustrated very clearly through the reading of selected essays which form an integral part of the textbook. Further appreciation of the presence of physics in our everyday lives will be gained as the students work through the solved examples and then tackle the problem sets at the ends of the chapters.
4) Like other LinC courses in the natural sciences, this course will

emphasize the basic elements of the science, involve a study of the quantitative and qualitative aspects of that science, demonstrate change and creativity in science, and address some of the broader implications of science. Through the laboratory component of the course, students will have an opportunity to learn and understand the scientific method.

REQUIRED TEXT: "Essentials of Physics", by John D. Cutnell and Kenneth W. Johnson, John Wiley, 2006.

ATTENDANCE POLICY: Each student is expected to attend all classes and laboratories. Daily attendance records will be kept. In the event that a quiz is missed, no make-up will be given. If the absence is EXCUSED, NO GRADE will be recorded for the missed quiz. However, if the absence is UNEXCUSED, a ZERO will be recorded for that quiz. In the event that an exam is missed, a make-up will be given provided the absence is EXCUSED. If the absence is unexcused, a ZERO will be recorded for that exam. In order for an absence to be excused, the student must present a) a valid medical excuse signed by a doctor or nurse, or b) an explanatory statement from the Dean of Students verifying that the absence qualifies as "excusable".

Written lab reports will generally be submitted at the end of the laboratory period. Any lab report which is turned in within 24 hours after that time will still receive full credit. Experiments submitted later than this will automatically be assigned a grade of ZERO. In the event that a student is absent from a laboratory and the absence is UNEXCUSED, no make-up will be permitted and a grade of ZERO will be recorded for that experiment.

In the event that the number of unexcused absences in the course exceeds three (3), ONE POINT will be subtracted from the student's final average for each additional unexcused absence following the third.

The Policy on Academic Honesty to be followed is:

Moravian College expects its students to perform their academic work honestly and fairly. A Moravian student, moreover, should neither hinder nor unfairly assist the efforts of other students to complete their work successfully. This policy of academic integrity is the foundation on which learning at Moravian is built. The College's expectations and the consequences of failure to meet those expectations are outlined in the current Student Handbook, available from the Student Affairs Office, and in the statement on Academic Honesty at Moravian College, available from the Academic Dean's Office. If, at any point in a student's academic work at Moravian, a student is uncertain about his or her responsibility as a scholar or about the propriety of a particular action, the instructor should be consulted. Any student failing to comply with the College's policy of academic honesty will be reported to the Academic Standards Committee.

GRADES will be determined as follows:

Quizzes and Exams.....50%
Laboratory.....25%
Final Exam.....25%

While grades will be computed by the indicated percentages, it is within the instructor's purview to apply qualitative judgment in determining the final grades for the course.

The following is a list of topics to be covered:

INTRODUCTION

1. What is physics?
2. Counting and Measuring. Accuracy and Precision
3. Dimensions and Units in Measurement
4. Calculating with Units
5. Significant Digits in Calculations
6. Physics Principles as Mathematical Equations
7. Vector and Scalar Quantities

8. Addition of Vectors
9. Subtraction of Vectors
10. Rectangular Components of Vectors
11. Trigonometric Addition of Vectors
12. Vector Subtraction Using Trigonometry

UNIFORMLY ACCELERATED MOTION

1. Units of Length and Time
2. Speed
3. Displacement and Average Velocity
4. Instantaneous Velocity
5. One-Dimensional Motion
6. Acceleration
7. Uniformly Accelerated Linear Motion
8. Equations for Uniformly Accelerated Motion
9. Freely Falling Bodies
10. Projectile motion
11. Relative Velocity

NEWTON'S LAWS OF MOTION

1. The Discvovery of Physical Laws
2. The Concept of Force; Newton's First Law
3. Inertia and Mass
4. Newton's Second Law
5. Action and Reaction; Newton's Third Law
6. Mass and its Relation to Weight
7. Friction Forces
8. Applications of Newton's Second Law
9. Weight and Weightlessness
10. Motion on an Incline

STATIC EQUILIBRIUM

1. The First Condition for Equilibrium
2. Solving Problems in Statics
3. Torque
4. The Second Condition for Equilibrium
5. The Center of Gravity
6. The Position of the Axis is Arbitrary

7. Back Injury from Lifting

WORK AND ENERGY

1. The Definition of Work
2. Power
3. Kinetic Energy
4. The Work-Kinetic Energy Theorem
5. Gravitational Potential Energy
6. The Center of Mass
7. The Gravitational Force is Conservative
8. Interconversion of Kinetic and Potential Energies
9. The Law of Conservation of Energy

LINEAR MOMENTUM

1. The Concept of Linear Momentum
2. Newton's Second Law Restated
3. Conservation of Linear Momentum
4. Elastic and Inelastic Collisions
5. Rockets and Jet Propulsion
6. Momentum in Two and Three Dimensions

MOTION IN A CIRCLE

1. Angular Displacement
2. Angular Velocity
3. Angular Acceleration
4. Angular Motion Equations
5. Tangential Quantities
6. Centripetal Acceleration
7. Centripetal Force
8. Rotating Frames of Reference
9. Newton's Law of Universal Gravitation
10. Orbital Motion
11. Apparent Weight and Weightlessness

ROTATIONAL WORK, ENERGY, AND MOMENTUM

1. Rotational Work and Kinetic Energy
2. Rotational Inertia
3. Combined Rotation and Translation

4. Angular Momentum

MECHANICAL PROPERTIES OF MATTER

1. Density and Specific Gravity
2. Hooke's Law; Elastic Moduli
3. Pressure in Fluids and Gases; The Atmosphere
4. Archimedes' Principle; Buoyancy
5. Viscosity and Fluid Flow
6. Bernoulli's Equation
7. Laminar Versus Turbulent Flow

TEMPERATURE ; KINETIC THEORY OF GASES

1. Thermometers and Temperature Scales
2. The Mole and Avogadro's Number
3. The Ideal Gas Law
4. Using the Gas Law
5. The Molecular Basis for the Gas Law
6. Distribution of Molecular Speeds

THERMAL PROPERTIES OF MATTER

1. The Concept of Heat
2. Thermal Energy
3. Heat Units
4. Specific Heat Capacity
5. Boiling and Heat of Vaporization
6. Melting and Heat of Fusion
7. Calorimetry
8. Thermal Expansion
9. Conduction, Convection, and Radiation

THE FIRST LAW OF THERMODYNAMICS

1. State Variables
2. The First Law
3. Work Done
4. Internal Energy of an Ideal Gas

The ASSIGNED PROBLEMS are as follows:

Chapter 1: 1, 3, 4, 7, 12, 14, 15, 16, 19, 23, 25, 32, 33, 42, 43, 45, 47

Chapter 2: 4, 6, 7, 9, 13, 16, 20, 23, 28, 31, 37, 43, 46, 49, 57, 58, 59

Chapter 3: 4, 6, 8, 11, 12, 13, 22, 24, 27, 29, 33, 38

Chapter 4: 3, 4, 5, 9, 11, 14, 15, 27, 32, 34, 36, 37, 43, 44, 46, 49, 50, 55, 58, 59, 67, 69, 71, 75, 79

Chapter 5: 2, 6, 7, 10, 13, 16, 19, 22, 25, 28

Chapter 6: 2, 3, 7, 9, 16, 23, 31, 34, 36, 37, 38, 45, 48, 59, 67

Chapter 7: 1, 4, 9, 15, 17, 19, 28, 30, 31, 41, 44

Chapter 8: 3, 5, 8, 15, 17, 21, 24, 28, 32, 35, 40, 42, 46, 52

Chapter 9: 2, 4, 6, 11, 17, 18, 20, 21, 30, 31, 32, 34, 38, 42, 50, 54, 56

Chapter 10: 1, 6, 9, 11, 14, 20, 24, 27, 33, 39, 40, 48, 50, 51

Chapter 11: 2, 4, 11, 13, 19, 20, 29, 32, 34, 38, 41, 51, 55, 58, 65

Chapter 12: 1, 2, 4, 13, 20, 30, 39, 43, 44, 51, 54, 60

Chapter 13: 2, 4, 6, 10, 16, 20, 21

Chapter 14: 2, 4, 10, 15, 29, 31, 33

Chapter 15: 1, 5, 10, 19

Chapter 16: 1, 2, 3, 12, 14, 22, 23, 38, 45, 58, 70, 72

Chapter 17: 8, 16, 20, 26, 29

Students who wish to request accommodations in this class for a disability should contact Mr. Joseph Kempfer, Assistant Director of Learning Services for Disability Support, 1307 Main Street (extension 1510). Accommodations cannot be provided until authorization is received from the Office of Learning Services.