**Syllabus**

# PHYS 226

*Physics of Motion Laboratory* for students in the sciences.

**Course Description and Course Objectives**

*Physics of Motion Laboratory* for students in the sciences. This is the first semester laboratory to accompany a two semester course sequence in introductory physics. This class will meet weekly in a 120-minute block to carry out various experiments. Topics include material covered in a typical calculus-based introductory physics course on the principles of mechanics and motion.

Knowledge to gain: To use laboratory activities to understand the material covered in the accompanying introductory physics course.

Skills to gain: Ability to carry out simple experiments and analyze the data collected to understand a variety of basic physics concepts. Become familiar with a variety of laboratory devices and how to use them to make measurements.

See list of **Learning Objectives**.

**Prerequisites**

MATH 151 or 171

A working knowledge of plane geometry, trigonometry, and algebra; a working knowledge of derivatives and integrals; proficiency in the use of vectors (addition, subtraction, dot and cross products).

**Co-Requisites**

Co-enrollment in PHYS 206.

**Text and Required Materials**

The text for this lab course is electronic and is hosted on the WebAssign.net website. You will need to purchase an access code for WebAssign for the labs by logging on to the website http://webassign.net/tamu/login.html.

**Laboratory Logistics**

The lab schedule is attached as well as being posted on the class web-page. The labs consist of three parts, 1) pre-lab, due before arriving for the lab activity, 2) in-lab, completed as a group assignment during the lab period, and 3) post-lab, due before the next scheduled lab meeting. Each of these assignments will be hosted through the online WebAssign package. Note that while we do not have a formal lab activity scheduled each week, in the weeks without a formal assignments students will be offered a chance to do some exploratory measurements to further enhance their understanding of the principles upon which the physics of electricity and magnetism are based

**Absences**

If you miss a lab due to an authorized excused absence as outlined in the University Regulations, you should attempt to contact your instructor to try and arrange to makeup the missed work during the week of your absence. If this is not possible, students will be given the opportunity to make-up the missed work by completing a separate make-up lab at the end of the semester.

Please see http://student-rules.tamu.edu/rule07 for information on excused absences.

**Course Topics and Schedule**

| Week | Topic |
|---|---|
| Week 1 | Introduction to WebAssign |
| Week 2 | Measurements |
| Week 3 | Vector Addition |
| Week 4 | Constant Acceleration |
| Week 5 | Investigation of Forces |
| Week 6 | Air Resistance |
| Week 7 | Elastic Collisions |
| Week 8 | Rotational Kinematics |
| Week 9 | Rotational Motion and Forces |
| Week 10 | Torques and Static Equilibrium |
| Week 11 | Springs and Simple Harmonic Motion |
| Week 12 | Simple Pendulum |
| Week 13 | Springs |
| Week 14 | Make-up lab |
| Week 15 | Make-up lab |

**Course Grade**

The overall course grade is weighted as follows: Each lab will be graded on the basis of 100 points, with 10% of the grade coming from the pre-lab quiz, 70% of the grade coming from the in-lab submission and 20% of the grade coming from the post-lab quiz.

The semester lab grade will be based on the average of a student's lab grades for the semester.

**Grading Scale**

A: 90-100
B: 80-89
C: 70-79
D: 60-69
F: <60

Additional grade information: http://student-rules.tamu.edu/rule10

**Web Page**

www.webassign.net/tamu/login.html – for the electronic lab manual and connection to the lab report system.

**ADA Policy**

The Americans with Disabilities Act (ADA) is a federal anti-discrimination statute that provides comprehensive civil rights protection for persons with disabilities. Among other things, this legislation requires that all students with disabilities be guaranteed a learning environment that provides for reasonable accommodation of their disabilities. If you believe you have a disability requiring an accommodation, please contact Disability Services, currently located in the Disability Services building at the Student Services at White Creek complex on west campus or call 979-845-1637. For additional information, visit http://disability.tamu.edu.

**Honor Code**

The Aggie Honor Code states, "An Aggie does not lie, cheat, or steal or tolerate those who do." Further information regarding the Honor Council Rules and Procedures may be found on the web at http://aggiehonor.tamu.edu.

**Learning Objectives:**

*Upon successful completion of this course, students will be able to:*

- Produce a mathematical description of movement in 1, 2, and 3 dimensions.
- Transform positions, velocities, and accelerations from one coordinate system to another system in relative motion with respect to the first one.
- Identify a basic set of forces, their origin, and their points of application in specific problems.
- Identify and isolate bodies and pictorially represent the direction and location of forces acting on the bodies.
- Compute the position of the center of mass and moment of inertia for different basic shapes in simple conditions.
- Apply Newton's Laws to quantitatively predict linear and rotational movement.
- Apply conservation laws to quantitatively describe linear and rotational movement.
- Compute of forces in problems of statics.
- Identify systems undergoing Simple Harmonic Motion, describe that movement, and compute the frequencies of oscillation.

**Learning Outcomes:**

*For each lab module listed below, the students will*

- Demonstrate to the instructor their knowledge of physical laws of motion describing a given lab experiment and a measurement procedure, as based on the pre-lab manual, the textbook, and any supplementary material;
- Apply critical thinking and scientific method in order to build a proper physical model of the experiment, formulate a set of assumptions and approximations behind the model, and identify sources of errors stemming from these approximations and the measurement procedure;
- Develop visual analysis and communication skills in order to
  - Analyze complex graphical information associated with each experiment such as a scheme of the experimental setup, any circuitry, or a scheme of connection to the measurement equipment;
  - Create scientific graphs based on the experimental data they obtain, including any applicable error bars
  - Use proper graphical information in the lab report.
- Develop oral communication skills in order to
  - Effectively communicate with instructor at the stage of pre-lab testing, preparing the experimental setup, and writing the report;
  - Effectively communicate with team members at all stages of the lab experiment: developing a physical model, taking data, troubleshooting, error analysis, data analysis, and report preparation. Each lab is a team project!
- Develop written communication skills in order to prepare a competent report of their experiment containing the experimental data, error analysis, and assessment of validity of a physical model.