Course Syllabus

Department: Science & Technology

Date: 2013.01.21

I. Course Prefix and Number: PHY108

   Course Name: Applied Physics I

   Credit Hours and Contact Hours: 4 Credit Hours - 6 Contact Hours

   Catalog Description including pre- and co-requisites: supporting data required for grade prerequisite of ‘C’ or higher. Applied Physics I is the first of two course sequence in physics required for students pursuing AAS degree in Instrumentation and Control Technologies geared towards careers in high-tech industries. Students are introduced to the elements of Kinematics, Dynamics, Energetics, Momentum, Rigid Bodies, Fluids and Thermodynamics, in context of technological systems using contemporary computational modeling, data acquisition and analysis. The incoming student must have a good grounding in high school algebra, with some exposure to trigonometry desired but not required. Preparation at the level of high school Physics or PHY 101 is strongly recommended. May not be substituted for PHY 118, PHY 119, PHY 151, or PHY 152. Co-requisite: MAT 145.

   Relationship to Academic Programs and Curriculum including SUNY Gen Ed designation if applicable:

   The primary audience for this course is students pursuing A.A.S. degree in Instrumentation and Control Technologies. Other students should verify the appropriateness of this course for her/his program with her/his advisor.

II. Course Student Learning Outcomes: State the student learning outcome(s) for the course (e.g. Student will be able to identify…)

   Upon completion of the course the student will be able to:
   
   ● Demonstrate understanding and use of Scientific Method
   ● Use contemporary Data Acquisition technologies for experimental measurements
   ● Demonstrate proficiency in calculations involving % changes or fractional changes in answers in response to known % changes or fractional changes in the input variables.
   ● Model physical problems related to mechanics, fluids and thermodynamics.
   ● Demonstrate proficiency in problem solving methodology.
   ● Demonstrate proficiency in teamwork, including assessment of learning process.
   ● Demonstrate an ability to relate mathematics and computer models to physical reality and vice versa.
   ● Estimate margins of errors in measurements and calculations.
   ● Assess limitations of what they know, and know how to seek further knowledge pertinent to the subject matter.
College Learning Outcomes Addressed by the Course: (check each College Learning Outcome addressed by the Student Learning Outcomes)

☐ writing  ☑ computer literacy  
☐ oral communications  ☐ ethics/values  
☐ reading  ☐ citizenship  
☑ mathematics  ☐ global concerns  
☑ critical thinking  ☐ information resources

III. Assessment Measures (Summarize how the college and student learning outcomes will be assessed): For each identified outcome checked, please provide the specific assessment measure.

<table>
<thead>
<tr>
<th>List identified College Learning Outcomes(s)</th>
<th>Specific assessment measure(s)</th>
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<tbody>
<tr>
<td>eg: writing</td>
<td>eg: student will complete a research paper</td>
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<tr>
<td>Mathematics</td>
<td>Student will complete quantitative assignment using mathematical methods to solve physics problems.</td>
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<tr>
<td>Critical Thinking</td>
<td>Student will complete complex problem solving assignment using all available resources.</td>
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<tr>
<td>Computer Literacy</td>
<td>Students will complete assignment wherein physical system will be modeled using computer software.</td>
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IV. Instructional Materials and Methods

Types of Course Materials:
1. Representative Textbook: College PHYSICS by Knight et.al.
2. Spreadsheet programs (Excel or Open Office) and LabVIEW.
3. Supplementary material, specified by instructor.

Methods of Instruction (e.g. Lecture, Lab, Seminar …):
Activities will emphasize that students apply problem solving techniques, with critical thinking, instead of rote memorization. The student will demonstrate proficiency with these techniques in individual as well as in team work, with and without use of computers. The students must be able to model problems appropriate for the given situation and criteria, and assess their performance.

1. Lectures / Demonstrations
2. Discussions and Team Activities
3. Laboratory exercises
4. Use of Computers to model physical systems using Spreadsheet program and LabVIEW, and verify results through experimental measurements.
5. One hour per week of team-taught learning activities facilitated by a pair of physics and mathematics teachers to improve the success and the retention rate of students in the course and the Instrumentation and Control Technologies curriculum.
V. General Outline of Topics Covered:

*Quantifying Reality*: Orders of Magnitude, Units of Measurements, Dimensional Analysis

*Kinematics*: 1-d Kinematics, 2-d Kinematics, Circular Motion


*Energetics I*: Kinetic Energy, Gravitational Potential Energy

*Momentum*: Linear Momentum, Collisions, Rocket Motion

*Rotational Dynamics*: Torque, Center of Gravity, Moment of Inertia, Angular Momentum

*Elasticity*: Hooke’s Law, Elastic Potential Energy, Strain and Stress

*Energetics II*: Gas Law & Kinetic Theory, Thermal Energy, Phase Change, Entropy

*Fluids*: Archimedes’ Law, Pascal’s Law, Bernoulli Equation