Course Syllabus

Department: Science & Technology

Date: 2013.01.21

I. Course Prefix and Number: PHY 109
   Course Name: Applied Physics II
   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 II is the second of a two course sequence in physics required for students pursuing AAS degree in Instrumentation and Control Technologies. Students are introduced to Oscillations, Waves, Electrostatics, DC Circuits, Magnetic Force and Sources, Faraday’s Law, Resonance in AC Circuits, Electromagnetic Waves and Optics in context of technological systems using contemporary computational modeling, data acquisition and analysis. Prerequisites: PHY 108 and MAT 145. Co-requisite: MAT 152. May not be substituted for PHY 118, PHY 119, PHY 151 or PHY 152.

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:
- Use contemporary Data Acquisition technologies for experimental measurements
- Model systems related to oscillations, waves, circuits, electricity and magnetism.
- Demonstrate proficiency in problem solving methodology.
- Demonstrate use of diverse techniques for verifying answers to problems
- Demonstrate proficiency in teamwork, including assessment of learning process.
- Demonstrate skills to solve descriptive problem scenarios such as case studies
- Assess limitations of what they know, and know how to seek further knowledge pertinent to the subject matter.
- Articulate understanding of analogous systems (mechanical, acoustic, optics, electrical) using common mathematical framework (such as normalized coordinates) and patterns of responses (such as Exponential Decay, Resonance, Waves, Source Geometry and Intensities Distributions).
College Learning Outcomes Addressed by the Course: (check each College Learning Outcome addressed by the Student Learning Outcomes)

- [ ] writing
- [ ] reading
- [x] oral communications
- [ ] ethics/values
- [ ] computer literacy
- [ ] citizenship
- [ ] global concerns
- [x] mathematics
- [x] 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 such as Component Kit and myDAQ.

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:

*Electrical Force:* Single Charge Source, Multiple Charge Sources

*Electrical Field:* Point, Linear and Planar Charge Distributions, Gauss’s Law, Capacitor

*Electrical Potential & Energy:* Energy Conversion, Batteries, Ohm’s Law, Electrical Power

*DC Circuits:* Series and Parallel Resistors, Charging and Discharging Capacitor

*Magnetic Force:* Moving Point Charge, Current Carrying Conductor

*Sources of Magnetic Field:* Wire Carrying Current, Solenoid

*Oscillations & Waves:* Harmonic and Driven Oscillations, Waves on String, Sound Waves

*Changing Magnetic Field:* Faraday’s Law, Inductor, AC Circuits, Motors and Generators

*Optics:* Reflection, Mirrors, Refraction, Lenses, Optical Instruments

*Electromagnetic Waves:* Electromagnetic Spectrum, Interference and Diffraction, Fiber Optics