COURSE SYLLABUS

Course Number: PHY 2048L L01
Prerequisite(s): PHY 2048
Course Credit: 1
College: ARTS AND SCIENCE
Department: PHYSICS
Faculty Name: Kennedy, Robin J.
Office Location: JONES HALL 112A
Office Hours

<table>
<thead>
<tr>
<th>Monday</th>
<th>Tuesday</th>
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<tr>
<td>9AM-10 AM</td>
<td>9AM-10 AM</td>
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</table>

Course Title: GENERAL PHYSICS LABORATORY I
Course Hours: 8:00AM-10:30AM TH

Required Text(s): GENERAL PHYSICS I LABORATORY MANUAL
By, FAMU Physics department
Supplies: FAMU Bookstore

Term and Year: Spring 2010
Place and Time:
FAMU DEV RESEARCH SCHOOL 00106
Telephone: (850) 599-3470
e-mail: drrobinjkennedy@netscape.net

Course Description
This is an introductory course that is design to illustrate the principles and concepts of physics taught in General physics I. Each laboratory experiment is design to give students experience in making measurements, gathering and interpreting data, manipulating certain laboratory equipment and carrying out calculations studied in lecture. It is a practical and up-to-date hands on experiments in physics for students in PHY2048.

Course Purpose
The course is to help students and prospective teachers to
A. Extract information from experiments in laboratory manual.
B. Collect and interpret data of various experiments.
C. Demonstrate independent work
D. Set-up experiment and obtain results through skilled time management.
E. Recognize and apply principles in the main area of General Physics I.

State and National Professional Standards for Training
In response to Florida’s demand for accountability from their public schools, the 1997 State Legislature created the Florida System of School Improvement and Accountability, which is designed to improve student performance. The Physics Department, in response to this initiative, strives to make a positive impact by ensuring that it produces high quality professional specialists in physics education who are

F=Florida Educator Accomplished Practices Standards (FEAPS)
I=Interstate New Teacher Assessment and Support Consortium Standards (INTASC)
(K)=Knowledge (S)=Skill (D)=Disposition
committed to improving student performance and who will assist students in meeting the Florida Sunshine State Standards. The Physics Department Physics Education program endeavors to provide a quality program through the implementation of an integrated curriculum based on the guidelines and competencies aligned with the Florida Sunshine State Standards, Florida Accomplished Practices, Florida Adopted Subject Area Competencies, and those guidelines and standards from other learned societies and professional organizations.

The Conceptual Framework in the Professional Education Unit at Florida A&M University’s College of Education is an integrated approach to providing educational experiences that result in exemplary professional educators. The Framework is comprised of many activities and themes with the mission of developing high quality classroom teachers, administrators and support personnel. The term “exemplary” refers to the kind of graduates the unit strives to produce. Figure 1 provides a diagram of the Exemplary Professional Conceptual Framework:

The Unit’s Conceptual Framework is consistent with and complements the College of Education and the University’s Mission statements. The shared vision of the Professional Education Unit is to prepare exemplary professionals who are able to go into the educational institutions of Florida, the nation and the world armed with knowledge, skills, and dispositions that will facilitate learning for students, support interactions and partnerships with community stakeholders, and engender on-going professional development for themselves and others. The conceptual framework provides direction for programs, courses, teaching, candidate performance, scholarship, service, and Unit accountability.

The Physics Education Program at Florida A&M University is committed to training professionals who have expertise in the depth and diversity of both in physics and education.

**Conceptual Framework**

The Conceptual Framework in the Professional Education Unit (PEU) at Florida A&M University is an integrated approach to providing educational experiences that result in exemplary professional educators. The Framework is comprised of six themes with the mission of developing high quality classroom teachers, administrators and support personnel. The term “exemplary” refers to the kind of graduates the PEU strives to produce. The figure below provides a diagram of the Exemplary Professional Conceptual Framework.

![Conceptual Framework Diagram](image)

**CRITICAL THINKING**

- **CF4**
  - Through this focal area, the FAMU professional education candidate will:

| CF: 4.5 (S) | Demonstrate the use of higher order thinking skills. | F: 4 | I: 4 |

**PROFESSIONALISM**

- **CF 5**
  - Through this focal area, the FAMU professional education candidate will:

| CF: 5.1 (K) | Know the content | F: 8 | I: 1 |

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_(K)=Knowledge (S)=Skill (D)=Disposition_
National and State Standards Addressed in the Course

Interstate New Teacher Assessment and Support Consortium (INTASC) Standards

Standard 1: Subject Matter: The teacher understands the central concepts, tools of inquiry, and structures of the discipline(s) he or she teaches and can create learning experiences that make these aspects of subject matter meaningful for students.

1.10 Knowledge
1.12 The teacher understands how students' conceptual frameworks and their misconceptions for an area of knowledge can influence their learning.

1.13 The teacher can relate his/her disciplinary knowledge to other subject areas.

Standard 4: Instructional Strategies: The teacher understands and uses a variety of instructional strategies to encourage students' development of critical thinking, problem solving, and performance skills.

4.10 Knowledge
4.11 The teacher understands the cognitive processes associated with various kinds of learning (e.g. critical and creative thinking, problem structuring and problem solving, invention, memorization and recall) and how these processes can be stimulated.

4.12 The teacher understands the principles and techniques, along with advantages and limitations, associated with various instructional strategies (e.g. cooperative learning, direct instruction, discovery learning, whole group discussion, independent study, interdisciplinary instruction).

4.13 The teacher knows how to enhance learning through the use of a wide variety of materials as well as human and technological resources (e.g. computers, audio-visual technologies, videotapes and discs, local experts, primary documents and artifacts, texts, reference books, literature, and other print resources).

Standard 8: Assessment: The teacher understands and uses formal and informal assessment strategies to evaluate and ensure the continuous intellectual, social and physical development of the learner.

8.10 Knowledge
8.11 The teacher understands the characteristics, uses, advantages, and limitations of different types of assessments (e.g. criterion-referenced and norm-referenced instruments, traditional standardized and performance-based tests, observation systems, and assessments of student work) for evaluating how students learn, what they know and are able to do, and what kinds of experiences and technology will support their further growth and development.

8.12 The teacher knows how to select, construct, and use assessment strategies, technology and instruments appropriate to the learning outcomes being evaluated and to other diagnostic purposes.

8.13 The teacher understands measurement theory and assessment-related issues, such as validity, reliability, bias, and scoring concerns.

Florida Educator Accomplished Practices (FEAP)

4. Uses appropriate techniques and strategies, which promote and enhance critical, creative, and evaluative thinking capabilities of students. CRITICAL THINKING
8. Demonstrates knowledge and understanding of the subject matter. SUBJECT MATTER KNOWLEDGE
Competencies and Skills required for Teacher Certification in Florida (FTCE)

1. **Knowledge of Nature of Scientific Investigation and Instruction In Physics**
   1.2 Identify potentially hazardous situations in a physics laboratory and classroom, methods of prevention, and corrective actions.
   1.3 Select the appropriate laboratory equipment for specific scientific investigations.

2. **Knowledge of the Mathematics of Physics**
   2.1 Determine the validity of a formula based on dimensional analysis.
   2.4 Convert between units of a given quantity (e.g., length, area, volume, mass, time, temperature).
   2.5 Identify prefixes in the metric system and standard units of measure (e.g., newtons, meters, kilowatt-hours, teslas, electron volts, calories, horsepower).
   2.6 Estimate the order of magnitude of a physical quantity.
   2.7 Interpret the slope of a graph or area under the curve in relation to physical concepts.
   2.8 Apply the concepts of accuracy, precision, uncertainty, and significant figures to measurements and calculations.

4. **Knowledge of mechanics**
   4.1 Analyze the motion of an object moving in one dimension, given a graph (e.g., displacement versus time, velocity versus time, acceleration versus time).
   4.2 Determine distance traveled, displacement, speed, velocity, acceleration, or time of travel for objects moving in one dimension.
   4.3 Determine distance traveled, displacement, speed, velocity, acceleration, or time of travel for objects moving in two dimensions (e.g., projectile motion).
   4.4 Apply Newton's laws of motion to problems involving linear motion of a body.
   4.5 Apply Newton's laws of motion to problems involving circular motion of a body.
   4.6 Identify action-reaction pairs of forces between two bodies.
   4.7 Apply conservation of momentum to problems in one or two dimensions.
   4.8 Analyze problems using the impulse-momentum theorem.
   4.9 Analyze problems using Newton's universal law of gravitation (e.g., orbital motion).
   4.10 Analyze problems involving static or kinetic frictional forces.
   4.11. Apply conservation of mechanical energy.
   4.12. Use Newton's second law to analyze problems involving two connected masses (e.g., Atwood machine, Atwood machine on inclined plane, blocks, massless pulley).
   4.13. Analyze problems involving torque (e.g., equilibrium, rotational dynamics).
   4.15. Analyze problems involving work done on mechanical systems (e.g., power, work-energy theorem).
   4.16. Analyze problems involving the relationships between depth, density of fluid, and pressure.
   4.17. Analyze problems involving the buoyant force on a submerged or floating object (i.e., Archimedes' principle).
   4.18. Analyze problems involving moving fluids (e.g., mass conservation, Bernoulli's principle).
   4.19. Analyze problems involving center of mass.
   4.20. Use free-body diagrams to analyze static or dynamic problems in two or three dimensions.
   4.21. Analyze characteristics and examples of simple harmonic motion (e.g., oscillating springs, vibrating strings, pendula).

5. **Knowledge of waves and optics**
   5.1 Identify characteristics of waves (e.g., velocity, frequency, amplitude, wavelength, period, pitch, intensity, phase, nodes, antinodes, transverse waveforms, longitudinal waveforms).
   5.2 Analyze the motion of particles in a medium in the presence of transverse and longitudinal waves.
   5.3 Identify factors that affect wave propagation and wave speed.

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5.4 Analyze problems involving the superposition, or interference, of waves (e.g., beats, standing waves, interference patterns).
5.5 Analyze problems involving standing waves (e.g., open or closed tube, vibrating string).
5.6 Analyze the Doppler effect due to the motion of a source or receiver.
5.7 Analyze waves, using either graphical or mathematical representations.
5.8 Analyze reflection and refraction problems using the law of reflection and Snell's law.
5.9 Interpret the relationships between wavelength, frequency, and speed of light.
5.10 Analyze the effects of linear polarizing filters on the polarization and intensity of light.
5.11 Analyze the geometric optics of thin lenses and mirrors.
5.12 Analyze patterns produced by diffraction and interference of light (e.g., single-slit, double-slit, diffraction gratings).
5.13 Identify the use and characteristics of various optical instruments (e.g., eye, spectroscope, camera, telescope, microscope, corrective lenses).
5.14 Apply the relationship between intensity and distance from a point source (i.e., inverse-square law).
5.15 Compare qualitative features of the ranges of the electromagnetic spectrum.

**Overall Goals of the Course**

The overall goals of the course are to help students and prospective teachers to:

A. Demonstrate the ability to communicate using the terminology of physics accurately verbally and in writing.
B. Extract information from laboratory manual, collect and interpret data of various experiments.
C. Solve experiment problems through skilled and time management.
E. Recognize and apply experimental skills in the main area of general physics I.
F. Adheres to relevant and professional code of Ethics.

**National Science Teachers Association Standards (NSTA)**

1. Understand and can successfully convey to students the major concepts, principles, theories, laws and interrelationships of their fields of licensure and supporting fields as recommended by the National Science Teachers Association. (NSTA 1.0a)
2. Use multiple assessment tools and strategies to achieve important goals for instruction that are aligned with methods of instruction and needs of students. (NSTA 8.0a)
3. Reflect constantly upon their teaching and identify ways and means through which they may grow professionally (NSTA 10.0b)

**Professional Organization/Learned Society Standards**

National Society of Science Teachers Association; American Association of Physics Teachers
Florida Teacher Certification Examination (FTCE) Subject Area Examination (SAE) Competencies and Skills
American Physics Society (APS)
National Society of Black Physicists (NSBP)

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### Academic Learning Compact

<table>
<thead>
<tr>
<th>Assignment</th>
<th>Behavioral objectives</th>
<th>INTASC Standards</th>
<th>NSTA Standards For Teachers of Physics</th>
<th>FEAPs</th>
<th>FTCE SAE</th>
<th>PEU Conceptual Framework</th>
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</thead>
<tbody>
<tr>
<td>Experiment # 1</td>
<td>Students will: 1. Understanding of physics through personal experimental investigation.</td>
<td>1.11, 4.11, 4.23</td>
<td>1C.5.a: I.0 - 4.0; 1C.5.b: 14.0, 21.0</td>
<td>1 4.1;</td>
<td>1 2.1; 2.4- 2.8; 4.1 – 4.21; 5:1 – 5.15</td>
<td>CF: 2.1(S), 4.1(K), 5.1(K)</td>
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<tr>
<td>Laboratory fundamentals</td>
<td>2. Demonstrate knowledge and application of statistical analysis of experimental data</td>
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<td>Experiment # 2</td>
<td>3. Demonstrate skills in presenting experimental results and analysis attaining a grade of 80% or higher</td>
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<td>Measurement and</td>
<td>4. Demonstrate skills of writing a scientific report to present the results and analysis of the experiments attaining a grade of 70% or higher</td>
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<td>Experiment # 3</td>
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<td>Experiment # 5</td>
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<td>Work-energy theorem</td>
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<td>Experiment # 6</td>
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<td>Conservation of linear</td>
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<td>Rotation and moment of</td>
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<td>Archimedes’ principle</td>
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<td>Experiment # 10</td>
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<tr>
<td>Harmonic motion I &amp; II</td>
<td>3. Demonstrate skills in presenting experimental results and analysis attaining a grade of 80% or higher</td>
<td>1.11, 4.11, 4.23</td>
<td>1C.5.a: I.0 - 4.0; 1C.5.b: 14.0, 21.0</td>
<td>1 4.1;</td>
<td>1 2.1; 2.4- 2.8; 4.1 – 4.21; 5:1 – 5.15</td>
<td>CF: 2.1(S), 4.1(K), 5.1(K)</td>
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<tr>
<td>Experiment Presentation</td>
<td>4. Demonstrate skills of writing a scientific report to present the results and analysis of the experiments attaining a grade of 70% or higher</td>
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## Course Artifacts

<table>
<thead>
<tr>
<th>Standards</th>
<th>Name of the Artifact 1</th>
<th>Name of the Artifact 2</th>
<th>Name of the Artifact 3</th>
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<tbody>
<tr>
<td>FEAP</td>
<td>CF: 2.1(S), 4.1(K), 5.1(K)</td>
<td>CF: 2.1(S), 4.1(K), 5.1(K)</td>
<td>CF: 2.1(S), 4.1(K), 5.1(K)</td>
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<tr>
<td>INTACS</td>
<td>1.11, 4.11, 4.23</td>
<td>1.11, 4.11, 4.23</td>
<td>1.11, 4.11, 4.23</td>
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<tr>
<td>NSTA For Teachers in Physics</td>
<td>1C.5.a: 10.0, 21.0</td>
<td>1C.5.a: 4.0, 10.0, 21.0</td>
<td>1C.5.a: 5.0, 10.0, 21.0</td>
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<tr>
<td>FTCE SAE</td>
<td>1.3; 2.1; 2.4 - 2.8</td>
<td>1.3; 4.11</td>
<td>1.3; 4.17</td>
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### Topical Outline

- Week 1, 2: No Class
- Week 3: Laboratory Fundamentals
- Week 4: Measurement and Instrumentations
- Week 5: Instantaneous and Average Velocity
- Week 6: Inclined Plane and Frictional Force
- Week 7: Work-Energy Theorem
- Week 8: Conservation of Linear Momentum
- Week 9: Rotation and Moment of Inertia
- Week 10: Torque and Equilibrium
- Week 11: Archimedes’ Principle
- Week 12: Harmonic Motion I
- Week 13: Harmonic Motion II
- Week 14: Make-up
- Week 15: Make-up

### Tentative Course Calendar

1\textsuperscript{st} Class meeting -------------------------- 8/23

<table>
<thead>
<tr>
<th>HOLIDAYS</th>
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<tbody>
<tr>
<td>Labor Day</td>
<td>9/6</td>
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<tr>
<td>Veterans Day</td>
<td>11/11</td>
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<tr>
<td>Thanksgiving</td>
<td>11/25-11/26</td>
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</tbody>
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Last Day to Withdrawal -------------------------- 10/29
Last Day of Classes -------------------------- 2/5
Final Exam -------------------------- 12/8-12

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**Teaching Methods**

Experiments illustrate the principles and concepts of physics taught in general physics I lecture. Each laboratory experiments is designed to give students experience in making measurements, gathering and interpreting data, manipulating certain laboratory equipment, and carrying out calculations studied in lecture.

**Course Evaluation**

Students will conduct 11 experiments with 1 introduction in Week 1 in a 12-week timeframe. Every week students will work in groups conducting the experiments and providing a lab report in the following week on that experiment and the data collected to be graded by the instructor.

Each experimental report must adhere to the following format:

I. Title page  
II. Experimental Objectives  
III. Theory  
IV. List of Materials and description of apparatus  
V. Experimental Procedures  
VI. Experimental Results  
VII. Conclusions  
VIII. Questions

Additionally, short 10 - 15 min written quizzes will be done in class to test student’s knowledge for each week’s lab prepared from the lab manual. A final exam will be conducted that will test the cumulative physics content of that complete 12-week period to be given during final exams week after the last week of classes in form of a 2-hour written exam in class.

**Grading**

11 experiments (each experiments is 10 points) 100 points  
(the lowest grade will be dropped)

EXPERIMENT # 1 Laboratory Fundamentals  
EXPERIMENT # 2 Measurement and Instrumentations  
EXPERIMENT # 3 Instantaneous and Average Velocity  
EXPERIMENT # 4 Inclined Plane and Frictional Force  
EXPERIMENT # 5 Work-Energy Theorem  
EXPERIMENT # 6 Conservation of Linear Momentum  
EXPERIMENT # 7 Rotation and Moment of Inertia  
EXPERIMENT # 8 Torque and Equilibrium  
EXPERIMENT # 9 Archimedes’ Principle  
EXPERIMENT # 10 Harmonic Motion I  
EXPERIMENT # 11 Harmonic Motion II

10 Quizzes 10 points  
1 Final exam 10 points

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Course grades will be determined using the grand total obtained with the following percentage weights:
1) Lab reports: 80%.
2) Quizzes: 10%
3) Final Exam: 10%.
4) Grading scale: 90–100% A, 80–89% B, 70–79% C, 60–69% D, <59% F.

Course Policies

Students are expected to come well prepared to perform the labs by thoroughly study the laboratory manual. Care should be exercise so no personal injuries or damage to equipment occur. Since some of the labs can be lengthy, students are expected to work as efficiently as possible. Since there can be many students in class, order must be maintained. The laboratory area must be straightened up at the end of the laboratory. No food, drink or gum is allowed in the laboratory. Any behavior or activity that the instructor determines to be inappropriate or disrupted will be result in penalties, ranging from reductions in grade to dismissal from the laboratory.

Reference