COURSE SYLLABUS

Course Number: PHY 2049
Prerequisite(s): MAC 2311
Course Credit: 4

Course Title: GENERAL PHYSICS II
Course Hours: 11:00AM -12:15 PM Tue, Thu

College: ART AND SCIENCE
Department: PHYSICS
Faculty Name: Kalayu Belay

Required Text(s): FUNDAMENTAL OF PHYSICS, 7th Edition
By David Holliday/Robert Resnick/ Jearl Walker
Supplies: John Wiley and Sons, Inc.

Term and Year: SPRING 2010
Place and Time: FAMU DEV RESEARCH SCHOOL 0100A
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Office Location: Fred S. Humphries Sci, Room 214

Office Hours
Monday
Tuesday 9am-10am
Wednesday
Thursday
Friday
Saturday

Course Description

The course is designed to enable the student to learn introductory physics with calculus for secondary physics education, chemistry, engineering, mathematics, physics, and biology major. A laboratory and recitation are required.

Course Purpose

The course is to help students and prospective teachers to:

A. Develop the use of computer-base strategies to illustrate and solve physics problems.
   Present of physics applications orally and in writing.
B. Extract information from physics text through analytic reading.
C. Calculate and interpret the results of various physics problems.
D. Solve real world engineering problems using physics principles.
E. Develop models of physical problems.
F. Collaborate effectively with team members.
G. Solve problems through skilled time management.
H. Recognize and apply basic principles in the main area of physics

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.

**CRITICAL THINKING**

- CF 4
  - 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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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 (FFAP)

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

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Competencies and Skills required for Teacher Certification in Florida (FTCE)

1. **Knowledge of Nature of Scientific Investigation and Instruction In Physics**
   1.1 Identify the characteristics and processes of scientific inquiry.
   1.4 Relate the historical development of the major concepts, models, and investigations in physics to current knowledge (e.g., force and motion, conservation principles, fields, quantum theory).
   1.5 Distinguish between scientific theories and laws in terms of their specific roles and functions.

2. **Knowledge of the Mathematics of Physics**
   2.1 Determine the validity of a formula based on dimensional analysis.
   2.2 Combine vectors using graphic and trigonometric methods.
   2.3 Determine the dot product and cross product of two vectors.
   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.

3. **Knowledge of Thermodynamics**
   3.1 Relate changes in length, area, or volume of a system to changes in temperature.
   3.2 Distinguish between the three methods of heat transfer (i.e., conduction, convection, radiation).
   3.3 Determine the amount of heat transferred by conduction or radiation.
   3.4 Interpret segments of graphs of temperature versus heat added or removed (e.g., latent heats, specific heats).
   3.5 Analyze pressure, volume, and temperature relationships using the ideal gas law.
   3.6 Apply the first law of thermodynamics (i.e., energy conservation) to physical systems.
   3.7 Calculate work done by or on a gas from pressure versus volume diagrams.
   3.8 Interpret pressure versus volume diagrams (e.g., identify isobaric, isothermal, and adiabatic processes).
   3.9 Determine the specific heat, latent heat, or temperatures of a substance, given appropriate calorimetric data.
   3.10 Apply the second law of thermodynamics (i.e., entropy increase) to physical processes.
   3.11 Relate temperature or pressure to kinetic molecular theory.

6. **Knowledge of electricity and magnetism**
   6.1 Determine the electric force on a point charge due to one or more other charges.
   6.2 Determine the electric potential difference between two points in an electric field.
   6.3 Analyze problems involving capacitance, with or without dielectrics.
   6.4 Analyze the electric field due to a charge distribution.
   6.5 Apply Gauss's law to determine or characterize an electric field.
   6.6 Analyze charge distributions in conductors and nonconductors.
   6.7 Simplify series and parallel combinations of resistors or capacitors.
   6.8 Solve problems using Ohm's law.
   6.9 Apply Kirchhoff's laws to analyze DC circuits.
   6.10 Determine the power dissipated through one or more elements of a DC circuit.
   6.11 Relate the resistance of a conductor to its geometry and resistivity.
   6.12 Analyze problems involving the direction and magnitude of the magnetic force acting on moving charges (e.g., mass spectrometer).
   6.13 Apply the laws of electromagnetic induction (i.e., Faraday's law, Lenz's law).
   6.14 Analyze problems involving AC circuits (e.g., transformers, peak current, root-mean-square voltage, frequency, reactance, resonant frequency, impedance).

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6.15 Identify principles and components involved in the operation of motors and generators.
6.16 Predict the magnetic fields associated with current-carrying conductors (e.g., long straight wires, loops, solenoids).

**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)

**Academic Learning Compact**

<table>
<thead>
<tr>
<th>Assignment</th>
<th>Behavioral objectives</th>
<th>INTASC Standards</th>
<th>NSTA For Teachers of Physics</th>
<th>FEAPs</th>
<th>FTCE SAE</th>
<th>PEU Conceptual Framework</th>
</tr>
</thead>
<tbody>
<tr>
<td>Homework: Selected physics and mathematics problem from the textbook and additional instructor addendums. Each homework assignment will address course content and is aimed at development problem solving skills.</td>
<td>Students will 1. Demonstrate knowledge of the lecture material, and 2. Develop and enhance the skill of analytical analysis and problem solving</td>
<td>1.10, 4.10, 8.10</td>
<td>1C.5.b: 12.0, 9.0, 18.0</td>
<td>4.1, 4.a, 4.b, 8.1, 8.a, 8.b</td>
<td>1.1: 1.4, 1.5, 2.1 – 2.8, 3.1 – 3.11, 6.1 – 6.16</td>
<td>CF 5.1(K), CF 4.5(S)</td>
</tr>
<tr>
<td>Exams: Three tests will cover the material of Chapters 1 - 12. Test 4 (Final) covers the material of Chapters 13-16.</td>
<td>Students will demonstrate knowledge (Chapters 1-16) and problem solving skill attaining a grade of 70% or higher.</td>
<td>1.10, 4.10, 8.10</td>
<td>1C.5.b: 12.0, 9.0, 18.0</td>
<td>4.1, 4.a, 4.b, 8.1, 8.a, 8.b</td>
<td>1.1: 1.4, 1.5, 2.1 – 2.8, 3.1 – 3.11, 6.1 – 6.16</td>
<td>CF 5.1(K), CF 4.5(S)</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>
</tr>
</thead>
<tbody>
<tr>
<td>PEU CF</td>
<td>Homework (10 problems) on Temperature; Heat and First Law and Second Law of Thermodynamics</td>
<td>Homework (10 problems) on Electric Charge; Electric Field Gauss’ Law; Electric Potential</td>
<td>Homework (10 problems) on Maxwell’s Equations Electromagnetic Waves</td>
</tr>
<tr>
<td>FEAP</td>
<td>CF: 4.1(K), 4.5(S), 5.1(K)</td>
<td>CF: 4.1(K), 4.5(S), 5.1(K)</td>
<td>CF: 4.1(K), 4.5(S), 5.1(K)</td>
</tr>
<tr>
<td>INTASC</td>
<td>4.1: 4.a,4.b; 8.1:a,8.b.</td>
<td>4.1: 4.a,4.b; 8.1:a,8.b.</td>
<td>4.1: 4.a,4.b; 8.1:a,8.b.</td>
</tr>
<tr>
<td>NSTA</td>
<td>1C.5.b: 12.0</td>
<td>1C.5b: 9.0, 18.0</td>
<td>1C.5b: 9.0, 18.0</td>
</tr>
<tr>
<td>For Teachers in Physics</td>
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<td></td>
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</tr>
<tr>
<td>FTCE SAE</td>
<td>3.1 – 3.11</td>
<td>6.1 – 6.6</td>
<td>6.13, 6.16</td>
</tr>
</tbody>
</table>

Topical Outline

- Week 1: Temperature
- Week 2: Heat and First Law of Thermodynamics
- Week 3: Kinetic Theory of Gases
- Week 4: Entropy and the Second Law of Thermodynamics
- Week 5: Electric Charge
- Week 6: Electric Field
- Week 7: Gauss’ Law
- Week 8: Electric Potential
- Week 9: Capacitance
- Week 10: Current and Resistance
- Week 11: Magnetic Field
- Week 12: Ampere’s Law
- Week 13: Faraday’s Law of Induction
- Week 14: Inductance
- Week 15: Maxwell’s Equations
- Week 16: Electromagnetic Waves

Tentative Course Calendar

1st Class meeting ----------------------------- 1/06
Week 5 ---------------- TEST #1
Week 9 ------------------ TEST #2
Week 13 ------------------ TEST #3
Week 16 ------------------ TEST #4

Holidays

- Martin Luther King --------------------- 1/18
- Spring Break -------------------------- 3/8-11
- Last Day to Withdrawal -------------- 3/26
- Last Day of Classes ------------------ 4/23
- Final Exam -------------------------- 4/26-30

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Teaching Methods

Experiences to be provided in this course may include reading assignments in the textbook. During lecture physics theory and concepts will be explained with sample problems to reinforce the understanding of subject. Solving problems is vital part of learning physics, at the end of each chapter, problems will be assigned. It will be web-base, using the University of Texas web-base. [https://hw.utexas.edu](https://hw.utexas.edu) The unique access code or class name for this course is 51230. All assignments will be due at midnight on the due date. A week after the assignments is given. Absolute no late assignments will be accepted.

Methods of Evaluations

The purpose of evaluating is to accurately reflect the extent to which the student has mastered the course content. Accordingly a variety of indicators will be used that included homework assignments, four tests, quizzes, class participation/attendance.

Homework Assignments: Problems from each section of the text will assigned each class. Unless otherwise stated they will be due one week after being assigned. Each homework assignment will address course content and is aimed at increasing your problem solving skills.

Class Participation and Student Led Discussions: Participation in class will be monitored and counts towards each student's grade.

Course Examinations/ Final Examination: There will be four in-class Tests and a Final Exams. These tests and the final exam will be given to assess your content knowledge on major concepts, principles, and physical laws. The final exam is cumulative.

- 4 TEST (each of 20 points, the lowest score will be dropped)----------------------------- 60 points
  
  TEST #1:
  Week 1 Temperature
  Week 2 Heat and First Law of Thermodynamics
  Week 3 Kinetic Theory of Gases
  Week 4 Entropy and the Second Law of Thermodynamics
  
  TEST #2
  Week 5 Electric Charge
  Week 6 Electric Field
  Week 7 Gauss’ Law
  Week 8 Electric Potential
  
  TEST 3
  Week 9 Capacitance
  Week 10 Current and Resistance
  Week 11 Magnetic Field
  Week 12 Ampere’s Law
  
  TEST 4
  Week 13 Faraday’s Law of Induction
  Week 14 Inductance
  Week 15 Maxwell’s Equations
  Week 16 Electromagnetic Waves

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- 10 Homework  ---------------------------------- 10 points
  Homework#1  Temperature; Heat and First Law of Thermodynamics
  Homework#2  Kinetic Theory of Gases; Entropy and the Second Law of Thermodynamics
  Homework#3  Electric Charge; Electric Field
  Homework#4  Gauss’ Law; Electric Potential
  Homework#5  Capacitance; Current and Resistance
  Homework#6  Magnetic Field; Ampere’s Law
  Homework#7  Faraday’s Law of Induction
  Homework#8  Inductance
  Homework#9  Maxwell’s Equations
  Homework#10 Electromagnetic Waves

- Final Exam ( 100 points ) ---------------------- 30 points
  ------------------
  100 points

**Grading**

100 - 90 = A  
98 - 80 = B  
79 – 70 = C  
69 – 60 = D  
< 59 = F

**Course Policies**

**ATTENDANCE:**
Given the nature of the subject it is to student responsibility to attend class. Each Student is expected to be prepared. Prepared means have text and any supplemental reading distributed, Ready to listen because “if you are not listening you are not learning”.

**WITHDRAWAL FROM CLASS WITHOUT PENALTY OF “F”**
To withdrawal from class, you must fill out and return in to the records office a drop form on or prior the midterm date listed on the front of the syllabus. If you stop coming to class without going to the proper withdrawal procedure will result in the assignment of a grade of “F” for the semester.

**ASSIGNMENT OF AN INCOMPLETE “I”**
An “I” will be assigned only to students, who fail to complete the course due to illness, Injury or other non-academic emergency. Only those students who were doing satisfactory work will be eligible for the “I” grade. An “I” must be satisfactorily removed during the following academic quarter or the symbol “I” will be changed to “F” by the Records office. In unusual circumstances, an instructor may extend an incomplete beyond

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the one-quarter deadline – not to exceed a total of three consecutive calendar quarters. In order to remove an “I”, student will not be permitted to re-register for the course. Please contact me if you should have extended illness or some other unavoidable non-academic emergencies.

ACADEMIC DISHONESTY:
Cheating may consist of stealing someone else’s answer on an exam to using notes of a “crib” sheet during exam. Should cheating be detected you will receive a zero on the given exam. Plagiarism may consist by presenting the work of others as your own work. Same as cheating, it will be penalized with a zero on the assignment.

References