MASTER SYLLABUS

COURSE NUMBER – COURSE NAME
PHYS 202 – Modern Physics

Created by: Dr. Lawretta Ononye
Updated by: Dr. Lawretta Ononye

Canino School of Engineering Technology!

Department: Physics!

Semester/Year: Fall 2018!
A. **TITLE**: Modern Physics

B. **COURSE NUMBER**: PHYS 202

C. **CREDIT HOURS**: (Hours of Lecture, Laboratory, Recitation, Tutorial, Activity)
   
   - # Credit Hours: 3
   - # Lecture Hours: 3 per week
   - # Lab Hours: per week
   - Other: per week

   **Course Length**: 15 Weeks

D. **WRITING INTENSIVE COURSE**: Yes ☒ No ☐

E. **GER CATEGORY**: None ☒ Yes: GER ☑
   
   *If course satisfies more than one*: GER ☑

F. **SEMESTER(S) OFFERED**: Fall ☐ Spring ☐ Fall & Spring ☑

G. **COURSE DESCRIPTION**:

   The atomic view of matter, relativity, special relativity, and introduction to quantum mechanics.

H. **PRE-REQUISITES**: None ☐ Yes ☑ If yes, list below:

   PHYS 132 (University Physics II) or PHYS 122 (College Physics II) 
   or permission of instructor

   **CO-REQUISITES**: None ☒ Yes ☐ If yes, list below:

   None
I. **STUDENT LEARNING OUTCOMES:** *(see key below)*

By the end of this course, the student will be able to:

<table>
<thead>
<tr>
<th>Course Student Learning Outcome [SLO]</th>
<th>Program Student Learning Outcome [PSLO]</th>
<th><strong>GER</strong> [If Applicable]</th>
<th><strong>ISLO &amp; SUBSETS</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>a. Solve motion problems using the special theory of relativity.</td>
<td></td>
<td>2-Crit Think ISLO ISLO</td>
<td>PS CA Subsets Subsets</td>
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<tr>
<td>b. Calculate relativistic energy and momentum.</td>
<td></td>
<td>2-Crit Think ISLO ISLO</td>
<td>PS Subsets Subsets Subsets</td>
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<tr>
<td>c. Appraise the quantum mechanical view of physics as compare to classical mechanics.</td>
<td></td>
<td>2-Crit Think ISLO ISLO</td>
<td>CA Subsets Subsets Subsets</td>
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<tr>
<td>d. Explain the basic tenets of quantum theory and calculate solution to quantum mechanical problems using Schrodinger’s equation.</td>
<td></td>
<td>2-Crit Think ISLO ISLO</td>
<td>PS CA Subsets Subsets</td>
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<tr>
<td>d. Demonstrate an understanding of physics application of scientific data, concepts and models.</td>
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<td>2-Crit Think ISLO ISLO</td>
<td>CA PS Subsets Subsets</td>
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**KEY**

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<tr>
<th><strong>ISLO #</strong></th>
<th><strong>Institutional Student Learning Outcomes [ISLO 1 – 5]</strong></th>
</tr>
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<tbody>
<tr>
<td>1</td>
<td>Communication Skills&lt;br&gt;Oral [O], Written [W]</td>
</tr>
<tr>
<td>2</td>
<td>Critical Thinking&lt;br&gt;Critical Analysis [CA], Inquiry &amp; Analysis [IA], Problem Solving [PS]</td>
</tr>
<tr>
<td>3</td>
<td>Foundational Skills&lt;br&gt;Information Management [IM], Quantitative Lit./Reasoning [QTR]</td>
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<tr>
<td>4</td>
<td>Social Responsibility&lt;br&gt;Ethical Reasoning [ER], Global Learning [GL], Intercultural Knowledge [IK], Teamwork [T]</td>
</tr>
<tr>
<td>5</td>
<td>Industry, Professional, Discipline Specific Knowledge and Skills</td>
</tr>
</tbody>
</table>

*Include program objectives if applicable. Please consult with Program Coordinator!*
J. **APPLIED LEARNING COMPONENT:**  Yes ☒  No ☐

If YES, select one or more of the following categories:

- ☒ Classroom/Lab
- ☐ Internship
- ☐ Clinical Placement
- ☐ Practicum
- ☐ Service Learning
- ☐ Community Service
- ☐ Civic Engagement
- ☐ Creative Works/Senior Project
- ☐ Research
- ☐ Entrepreneurship
  (program, class, project)

K. **TEXTS:**


L. **REFERENCES:**

None

M. **EQUIPMENT:** None ☐  Needed: Technology enhanced classroom

N. **GRADING METHOD:**  A-F

O. **SUGGESTED MEASUREMENT CRITERIA/METHODS:**

- Exams
- Quizzes
- Homework
- Participation
- Project

P. **DETAILED COURSE OUTLINE:**

I. Review of Classical Physics
   A. Forces
   B. Momentum
   C. Work-energy
   D. Field forces
   E. Electric and magnetic fields
   F. Waves

II. Special Theory of Relativity
   A. Invariance of the speed of light in inertia frames
   B. Length contraction
   C. Time dilation
   D. Doppler shift
   E. Relative velocities
   F. Mass and energy equivalence

III. Particle Nature of Waves
   A. Photo electric effect
   B. Black body radiation
   C. Compton effect.
D. Bremsstrahlung

IV. Wave Nature of Particles
A. DeBye waves
B. Electron diffraction
C. Neutron diffraction

V. Quantum Mechanics
A. Quantum theory.
B. Schrodinger equation
C. Step function
D. One, two, and three –dimensional wells
E. Simple oscillator

VI. The Hydrogen Atom
A. Hydrogen spectrum.
B. Bohr model.
C. Schrodinger’s equation for Hydrogen –Separation of variables
D. Eigen values for hydrogen
E. Pauli’s exclusion principle
F. Selection rules

VII. Statistical Mechanics
A. Statistical methods.
B. Boltzmann distributions
C. Bose-Einstein distribution
D. Fermi-Dirac distribution

VIII. Solid State
A. Types of bonding
B. Periodic structure of crystals
C. Free electron theory
D. Bond theory
E. Semi-conducting diodes and transistors

IX. Nuclear Physics
A. Nuclear structure
B. Radioactivity
C. Fusion and fission
D. Chain reactions

Q. LABORATORY OUTLINE: None ☒ Yes ☐

N/A