**STATE UNIVERSITY OF NEW YORK !**
**COLLEGE OF TECHNOLOGY !**
**CANTON, NEW YORK !**


# 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:

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

| **KEY** | **Institutional Student Learning Outcomes [ISLO 1 – 5]** |
|---|---|
| **ISLO #** | **ISLO & Subsets** |
| **1** | **Communication Skills**<br>Oral [O], Written [W] |
| **2** | **Critical Thinking**<br>*Critical Analysis [CA] , Inquiry & Analysis [IA] , Problem Solving [PS]* |
| **3** | **Foundational Skills**<br>*Information Management [IM], Quantitative Lit,/Reasoning [QTR]* |
| **4** | **Social Responsibility**<br>*Ethical Reasoning [ER], Global Learning [GL], Intercultural Knowledge [IK], Teamwork [T]* |
| **5** | **Industry, Professional, Discipline Specific Knowledge and Skills** |

*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:**

Serway/Moses/Moyer (3rd Edition). Modern Physics. Belmont, CA: Brooks/Cole Publishing.

**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. <u>LABORATORY OUTLINE</u>: None ☒ Yes ☐**

**N/A**