

This syllabus is provided as a general informational guide. Some of the information may vary depending on the specific course section and instructor. Different sections of the same course may require different textbooks. Verify the section specific textbook information in the CUNY's Academic Course Schedule Web Page. Modifications of the grading system presented here will be communicated by the instructors of the sections when they meet the class.

BOROUGH OF MANHATTAN COMMUNITY COLLEGE

City University of New York

Department of Science

Title of Course MODERN PHYSICS

PHY 240 Section _____

SPRING 2019

Credits 3

Class hours 4

Instructor Information

Name:

Office:

Room:

Email:

Office Hours

Course Description

This is an introduction to the physics of the twentieth and twenty first centuries. There is a special emphasis placed on the two revolutions that altered the course of thinking about the universe: Relativity and Quantum Mechanics. Also considered are nuclear and elementary particle physics.

Student Learning Outcome	
1.	Demonstrated ability to solve relativity of space and time problems.
2.	Demonstrated ability to solve relativistic mass, energy, and momentum problems.
3.	Demonstrated ability to solve problems involving the quantization of mass, charge, light, and energy including Avogadro's number, black-body radiation, photoelectric effect, and Compton scattering.
4.	Described various models of the atom and explained why each was proposed and rejected except for the quantum model.
5.	Demonstrated ability to apply wave-particle duality and uncertainty principle to solve physics problems.
6.	Demonstrated ability to solve quantum mechanical eigenvalue equations for various operators and obtain expectation values of the corresponding observables.
7.	Demonstrated ability to solve 1-D quantum problems including the quantum particle in a box, a well, the simple harmonic oscillator, and the transmission and reflection of waves.
8.	Demonstrated ability to solve 3-D quantum problems including dealing with separation of variables, quantization of orbital angular momentum, electron spin, spin-orbit coupling, and total angular momentum.
9.	Demonstrated ability to solve problems involving the wave functions of the hydrogen atom and explain the organization of the periodic table of the elements.
10.	Demonstrated ability to apply the classical Maxwell-Boltzmann distribution and the equipartition theorem to solve physics problems.
13.	Demonstrated ability to apply nuclear energy level diagrams to solve problems involving alpha, gamma, and isobaric decay.
15.	Demonstrated ability to solve problems involving the properties of the nucleus including radius, binding energy, etc.

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Prerequisites/Co-requisites

Prerequisite PHY 225
Corequisite: MAT 501

Required Text & Readings

“Physics for Scientists and Engineers with modern Physics Volume -Technology Update” 10th Edition

Authors: R.A. Serway and J.W. Jewitt

Publisher: CENGAGE Learning

ISBN-13: 978-1-337-55343-8

ISBN-10: 1-337-55343-3

Student Copy ISBN:

978-1-337-55327-8

Other Resources

Use of Technology (if applicable):

Scientific calculator

Evaluation & Requirements of Students

3 examinations	40%
WI project/paper	20%
Home assignments	10%
Final exam.	30%

Course Student Learning Outcomes (Students will be able to...)	Measurements (means of assessment for student learning outcomes listed in first column)
1.Students will be able to gain insight into the developments in physics from the beginning of the twentieth century to the present day	1. Graded examination and homework essay questions.
2. Students will be able to apply their problem-solving skills to modern physics materials.	2. Graded homework and examination Problems.
3. Students will be able to apply differential equations to problems in modern physics.	3. Graded homework and examination Problems.

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	General Education Learning Outcomes	Measurements (means of assessment for general education goals listed in first column)
<input type="checkbox"/>	Communication Skills- Students will be able to write, read, listen and speak critically and effectively.	
➤ <input type="checkbox"/>	Quantitative Reasoning- Students will be able to use quantitative skills and the concepts and methods of mathematics to solve problems.	Examination and homework problems
➤ <input type="checkbox"/>	Scientific Reasoning- Students will be able to apply the concepts and methods of the natural sciences.	Exam questions, homework assignment, . Class discussions and essays.
<input type="checkbox"/>	Social and Behavioral Sciences- Students will be able to apply the concepts and methods of the social sciences.	
<input type="checkbox"/>	Arts & Humanities- Students will be able to develop knowledge and understanding of the arts and literature through critiques of works of art, music, theatre or literature.	
<input type="checkbox"/>	Information & Technology Literacy- Students will be able to collect, evaluate and interpret information and effectively use information technologies.	
<input type="checkbox"/>	Values- Students will be able to make informed choices based on an understanding of personal values, human diversity, multicultural awareness and social responsibility.	

Writing Intensive

This is a Writing Intensive course that fulfills the WI requirement for graduation. Writing intensive courses pay special attention to developing critical reading, writing, and analytic skills to prepare students for college-level coursework in general. Both informal and formal writing will be designed to maximize your understanding of the subject matter. Formal writing assignments, at least 10-12 pages total, account for a significant portion of your grade and will include opportunities for revision.

Student Learning Outcomes for WI component:

Measurements:

1. Student will be able to complete formal assignments of totaling least 10-12 pages in length that has/have gone through the revision process (e.g. writing assignments)
2. Student will be able to generate pieces of informal writing in response to a variety of prompts, concepts, situations or reading assignments.

Examples of student paper writing

Examples of student writing

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<u>WEEK</u>	<u>TOPICS</u>	<u>CHAPTERS</u>
1	Relativity Theory I	1
2	Relativity Theory II	2
3	The Quantum Theory of Light	3
	The Particle Nature of Matter	4
4	Matter Waves	5
5	Quantum Mechanics in One Dimension	6
6	Tunneling Phenomena	7
7.	Quantum Mechanics in Three Dimensions	8
8	Atomic Structure	9
9	Statistical Physics	10
10	Molecular Structure	11
11	The Solid State	12
13	Nuclear Structure	13
14	Nuclear Physics Applications	14
15	Elementary Particles	15
Final Examination		