PHYS 20B Course Outline as of Fall 2020

CATALOG INFORMATION

Dept and Nbr: PHYS 20B Title: GENERAL PHYSICS PART II
Full Title: General Physics Part II
Last Reviewed: 4/8/2019

Units		Course Hours per Week		Nbr of Weeks	Course Hours Total	
Maximum	4.00	Lecture Scheduled	3.00	17.5	Lecture Scheduled	52.50
Minimum	4.00	Lab Scheduled	3.00	8	Lab Scheduled	52.50
		Contact DHR	0		Contact DHR	0
		Contact Total	6.00		Contact Total	105.00
		Non-contact DHR	0		Non-contact DHR	0

Total Out of Class Hours: 105.00 Total Student Learning Hours: 210.00

Title 5 Category:	AA Degree Applicable
Grading:	Grade or P/NP
Repeatability:	00 - Two Repeats if Grade was D, F, NC, or NP
Also Listed As:	
Formerly:	

Catalog Description:
This is a continuation of Phys 20A. This course covers electricity and magnetism, light, and modern physics.

Prerequisites/Corequisites:
Course Completion of PHYS 20 and PHYS 20L; or Course Completion of PHYS 20A

Recommended Preparation:

Limits on Enrollment:

Schedule of Classes Information:
Description: This is a continuation of Phys 20A. This course covers electricity and magnetism, light, and modern physics. (Grade or P/NP)
Prerequisites/Corequisites: Course Completion of PHYS 20 and PHYS 20L; or Course Completion of PHYS 20A
Recommended:
Limits on Enrollment:
Transfer Credit: CSU;UC.

Repeatability: Two Repeats if Grade was D, F, NC, or NP

ARTICULATION, MAJOR, and CERTIFICATION INFORMATION:

AS Degree:	**Area**		Effective:	Inactive:
	C	Natural Sciences	Fall 2020	
CSU GE:	**Transfer Area**		Effective:	Inactive:
	B1	Physical Science	Fall 2020	
	B3	Laboratory Activity		
IGETC:	**Transfer Area**		Effective:	Inactive:
	5A	Physical Sciences	Fall 2020	
	5C	Fulfills Lab Requirement		

CSU Transfer:	Transferable	Effective:	Fall 2020	Inactive:
UC Transfer:	Transferable	Effective:	Fall 2020	Inactive:

CID:

CID Descriptor:PHYS 100S	Algebra/Trigonometry-Based Physics: AB
SRJC Equivalent Course(s):	PHYS20 AND PHYS20L AND PHYS21 AND PHYS21L OR PHYS20A AND PHYS20B
CID Descriptor:PHYS 110	Algebra/Trigonometry-Based Physics B
SRJC Equivalent Course(s):	PHYS21 AND PHYS21L OR PHYS20B

Certificate/Major Applicable:
Major Applicable Course

COURSE CONTENT

Student Learning Outcomes:
At the conclusion of this course, the student should be able to:
1. Apply physics principles and laws to analyze and solve problems related to electricity, magnetism, light, and optics through critical thinking, problem solving, mathematical modeling, and laboratory experimentation.
2. Compare and contrast elements of classical and modern physics.
3. Collect and analyze experimental data related to principles of physics, including appropriate use of units and significant figures.

Objectives:
At the conclusion of this course, the student should be able to:
1. Analyze electric fields and potentials.
2. Relate capacitors to electrostatics.
3. Analyze alternating and direct current (AC and DC) circuits.
4. Describe magnetism in relation to electric current and calculate the force on a moving charge.
5. Solve problems related to Faraday's law of induction.
6. Explain the concepts related to geometric optics and optical systems.
7. Apply the concept of wave interference to explain interference patterns.
8. Describe the concepts of special relativity.
9. Explain various concepts related to atomic/nuclear and quantum physics.

Lab objectives:
1. Conduct experiments that apply the scientific method and error analysis to explore physics

principles related to electricity, magnetism, light and optics, and modern physics.
2. Use manual and computerized data collection techniques to measure and analyze parameters related to electricity, magnetism, light and optics, and modern physics.
3. Plot, curve fit, and interpret data using a spreadsheet or other analysis tool.

Topics and Scope:

I. Electrostatics and Fields
- A. Electric charges and field lines
- B. Coulomb's law
- C. Gauss' Law

II. Electric Potential
- A. Potential difference in a uniform electric field
- B. Electric potential of point charges

III. DC Circuits
- A. Batteries and EMF
- B. Resistors in series and parallel
- C. Resistivity
- D. Kirchhoff's rules
- E. Capacitors
- F. RC circuits

IV. Magnetic Forces and Fields
- A. Magnetic force on a moving charge
- B. Magnetic force on a current carrying conductor
- C. Torque on a current loop in a uniform magnetic field
- D. Ampere's law

V. Electromagnetic Induction
- A. Faraday's law
- B. Lenz's law
- C. Inductance and transformers

VI. AC Circuits
- A. Capacitors and inductors in AC circuits
- B. RLC circuits
- C. Resonance

VII. Electromagnetic Waves
- A. Properties of waves: speed, wavelength, frequency
- B. Energy and electromagnetic waves
- C. Doppler effect and electromagnetic waves

VIII. Geometric Optics
- A. Nature of light
- B. Reflection and refraction of light
- C. Total internal reflection

IX. Lenses, mirrors, and optical instruments
- A. Plane and spherical mirrors
- B. Lenses and image formation
- C. Applications

X. Wave optics and Polarization of Light
- A. Interference
- B. Diffraction
- C. Polarization

XI. Special Relativity
- A. Postulates of special relativity

B. Time dilation
C. Length contraction
D. Equivalence of mass and energy

XII. Quantum Physics
A. Wave-particle duality
B. Blackbody radiation
C. Photoelectric effect
D. Wave nature of matter

XIII. Atomic Physics and the Emission of Light
A. Bohr model of the atom and line spectra
B. Rutherford scattering
C. Quantum mechanical picture of the atom

XIV. Nuclear Physics
A. Nuclear structure
B. Radioactive decay and dating
C. Radiation detectors

Lab Topics:
I. Laboratory Safety and Procedures
II. Writing Lab Reports
III. Measurement Techniques for Electromagnetic and Optical Phenomena
A. Manual data collection with calipers, meter sticks, etc.
B. Computerized data collection with field detectors, spectrometers, oscilloscopes, etc.
IV. Data Processing and Graphing Results with Spreadsheets
V. Error Analysis

Assignment:

Lecture-Related Assignments:
1. Homework problem sets (12 - 20)
2. Quizzes (0 - 15)
3. Midterm exams (3 - 5)
4. Final exam

Lecture- and Lab-Related Assignments:
1. Individual and/or group lab experiments and reports (12-16)

Methods of Evaluation/Basis of Grade:

Writing: Assessment tools that demonstrate writing skills and/or require students to select, organize and explain ideas in writing.

Lab reports (individual and group)	Writing 10 - 25%

Problem Solving: Assessment tools, other than exams, that demonstrate competence in computational or non-computational problem solving skills.

Homework problem sets	Problem solving 10 - 30%

Skill Demonstrations: All skill-based and physical demonstrations used for assessment purposes including skill performance exams.

None	Skill Demonstrations 0 - 0%

Exams: All forms of formal testing, other than skill performance exams.

Quizzes, midterm exams, and final exam	Exams 50 - 75%

Other: Includes any assessment tools that do not logically fit into the above categories.

Lecture and laboratory participation	Other Category 0 - 10%

Representative Textbooks and Materials:
Physics. 11th ed. Cutnell, John and Johnson, Kenneth and Young, David and Stadler, Shane. Wiley. 2018
College Physics: A Strategic Approach. 4th ed. Knight, Randall and Jones, Brian and Field, Stuart. Pearson. 2018
Essentials of College Physics. Serway, Raymond and Vuille, Chris. Cengage Learning. 2007 (Classic)
Instructor-prepared lab manual