

PHYS 21 Course Outline as of Fall 2019

CATALOG INFORMATION

Dept and Nbr: PHYS 21

Title: GENERAL PHYSICS PART II

Full Title: General Physics Lecture Part II

Last Reviewed: 4/22/2019

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

Total Out of Class Hours: 105.00

Total Student Learning Hours: 157.50

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: PHYS 2B

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

**Prerequisites/Corequisites:**  
Course Completion of PHYS 20 and Concurrent Enrollment in PHYS 21L

**Recommended Preparation:**

**Limits on Enrollment:**

**Schedule of Classes Information:**  
Description: This is a continuation of Phys 20. This course covers electricity and magnetism, light, and modern physics. (Grade or P/NP)  
Prerequisites/Corequisites: Course Completion of PHYS 20 and Concurrent Enrollment in PHYS 21L  
Recommended:  
Limits on Enrollment:  
Transfer Credit: CSU;UC.

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

## **ARTICULATION, MAJOR, and CERTIFICATION INFORMATION:**

<b>AS Degree:</b>	<b>Area</b>		Effective:	Inactive:
	C	Natural Sciences	Spring 1982	
<b>CSU GE:</b>	<b>Transfer Area</b>		Effective:	Inactive:
	B1	Physical Science	Spring 1982	
<b>IGETC:</b>	<b>Transfer Area</b>		Effective:	Inactive:
	5A	Physical Sciences	Spring 1982	
<b>CSU Transfer:</b>	Transferable	Effective:	Spring 1982	Inactive: Fall 2021
<b>UC Transfer:</b>	Transferable	Effective:	Spring 1982	Inactive: Fall 2021

<b>CID:</b>	
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:**

Students will 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.

### **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

### Assignment:

1. Homework problem sets (12 - 20)
2. Quizzes (0 - 15)
3. Exams (3 - 5)
4. Final exam
5. Reading 20-40 pages per week

### 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.

None, This is a degree applicable course but assessment tools based on writing are not included because problem solving assessments are more appropriate for this course.

Writing  
0 - 0%

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

Homework problem sets

Problem solving  
15 - 35%

**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, exams

Exams  
65 - 85%

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

None

Other Category  
0 - 0%

### 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)