

# PHYSICS, BACHELOR OF SCIENCE

## Expected Student Outcomes

Upon successful completion of the physics major, students will be able to:

- Think critically and logically and use the scientific method in their future investigations.
- Understand and apply knowledge of various subfields of physics at the undergraduate level and make a successful transition to technical fields, including engineering, teaching, business, and graduate studies.
- Effectively communicate their results orally and in writing.
- Learn independently, locate and use appropriate sources of technical material and make use of modern scientific and computational tools.

## Outcomes Assessment Activities

The Physics Program faculty will assess the skills, capacities, and knowledge of its majors as follows:

- The student must complete a senior research project including a formal presentation of results both in writing and orally to at least two members of the physics faculty (except for those in the teaching emphasis areas).
- The student must take the Physics Major Field Achievement Test offered by The Educational Testing Services (ETS) or another departmentally approved exam covering the sub-fields in physics at some point during his/her senior year (except for those in the teaching emphasis areas).
- By maintaining a portfolio for each student which contains college grades, records of special skills acquired, senior research project results, Field Achievement Test results and a record of co-curricular activities. The portfolio will remain on file in the department and will be added to as additional information is obtained from student or employer.

The program faculty believes that improvement in the skills, capacities, and knowledge of its minors can be assessed through required course work. The course grade will be a measure of the student's grasp of the basics in each discipline.

## Specific Program Requirements

- Students graduating with a BS in physics must complete physics courses in their program with grades of C or better.
- Students graduating with a minor in physics must have at least a 2.000 grade-point average in physics.
- A 2.500 grade-point average in the major area is required for admission to the teacher education program.
- Physics majors are expected to complete at CSU Pueblo all physics courses in their program numbered above PHYS 323. Minors are expected to complete at least 7 credit hours of upper division physics courses at CSU Pueblo.
- Students must have earned a C or better grade in lower-division prerequisite courses before being admitted to upper-division courses in physics.

- In all but the teaching concentration areas, students must demonstrate knowledge of computer programming.
- In all but the teaching concentration areas, majors are required to take the senior research course, in which students become involved in a theoretical or experimental research problem relating to physics under the supervision of a department faculty member.
- A fundamental understanding of chemistry and its lab techniques is required of all majors.

Course	Title	Credits
<b>PHYS Courses</b>		
PHYS 221 & 221L	GENERAL PHYSICS I and GENERAL PHYSICS I LAB	5
PHYS 222 & 222L	GENERAL PHYSICS II and GENERAL PHYSICS II LAB	5
PHYS 301	ANALYTICAL AND ORBITAL MECHANICS	4
PHYS 321	THERMODYNAMICS	3
PHYS 322	ADVANCED LABORATORY - THERMO	1
PHYS 323 & 323L	GENERAL PHYSICS III and GENERAL PHYSICS III LAB	5
PHYS 341	OPTICS	3
PHYS 342	ADVANCED LABORATORY-OPTICS	1
PHYS 431	ELECTRICITY AND MAGNETISM	4
PHYS 432	ADVANCED LABORATORY-ELECTRICITY AND MAGNETISM	1
PHYS 441	QUANTUM MECHANICS	4
PHYS 480	PRACTICUM IN LABORATORY INSTRUCTION	1
PHYS 492	RESEARCH	1
PHYS 493	SEMINAR	1
PHYS 499	THESIS RESEARCH	1
<b>Other Required Courses</b>		
CHEM 121 & 121L	GENERAL CHEMISTRY I and GENERAL CHEMISTRY LAB I	5
CHEM 122 & 122L	GENERAL CHEMISTRY II and GENERAL CHEMISTRY LAB II	5
MATH 242	INTRODUCTION TO COMPUTATION (The higher level and Python language of Math 242 is needed to increase the computational skill of majors and graduates.)	4
MATH 126	CALCULUS AND ANALYTIC GEOMETRY I	5
MATH 207	MATRIX AND VECTOR ALGEBRA WITH APPLICATIONS	3
MATH 224	CALCULUS AND ANALYTIC GEOMETRY II	5
MATH 325	INTERMEDIATE CALCULUS	4
MATH 337	DIFFERENTIAL EQUATIONS I	3
MATH 338	DIFFERENTIAL EQUATIONS II	3
<b>Approved Math Elective</b>		
Select 3-4 credits		3-4
<b>General Education</b>		
Select 24 credits		24
<b>Electives</b>		
Select 16-17 credits		16-17
Total Credits		120-122

# Planning Sheet

Disclaimer: The Planning Sheet is designed as a guide for student's planning their course selections. The information on this page provides only a suggested schedule. Actual course selections should be made with the advice and consent of an academic advisor. While accurately portraying the information contained in the college catalog, this form is not considered a legal substitute for that document. Students should become familiar with the catalog in effect at the time in which they entered the institution.

Course	Title	Credits
<b>Year 1</b>		
<b>Fall</b>		
CHEM 121 & 121L	General Chemistry I (GT-SC2) and General Chemistry Lab I (GT-SC1)	5
ENG 101	Rhetoric & Writing I (GT-CO1)	3
MATH 126	Calculus and Analytic Geometry I (GT-MA1)	5
General Education		3
	Credits	16
<b>Spring</b>		
ENG 102	Rhetoric & Writing II (GT-CO2)	3
MATH 207	Matrix and Vector Algebra with Applications	3
MATH 224	Calculus and Analytic Geometry II	5
PHYS 221 & 221L	General Physics I (GT-SC2) and General Physics I Lab (GT-SC1)	5
	Credits	16
<b>Year 2</b>		
<b>Fall</b>		
MATH 242 or EN 103	Introduction to Computation or Problem Solving for Engineers	3-4
MATH 325	Intermediate Calculus	4
PHYS 222 & 222L	General Physics II (GT-SC2) and General Physics II Lab (GT-SC1)	5
General Education		3
	Credits	15-16
<b>Spring</b>		
CHEM 121 & 121L	General Chemistry I (GT-SC2) and General Chemistry Lab I (GT-SC1)	5
MATH 337	Differential Equations I	3
PHYS 323 & 323L	General Physics III and General Physics III Lab	5
General Education		3
	Credits	16
<b>Year 3</b>		
<b>Fall</b>		
MATH 338	Differential Equations II	3
PHYS 341	Optics	3
PHYS 342	Advanced Laboratory-Optics	1
General Education		6
Elective		3
	Credits	16
<b>Spring</b>		
PHYS 301	Analytical and Orbital Mechanics	4
PHYS 321	Thermodynamics	3
PHYS 322	Advanced Laboratory - Thermo	1
PHYS 492	Research	1
General Education		3
Elective		1-2
	Credits	13-14
<b>Year 4</b>		
<b>Fall</b>		
PHYS 431	Electricity and Magnetism	4

PHYS 432	Advanced Laboratory-Electricity and Magnetism	1
PHYS 480	Practicum in Laboratory Instruction	1
Elective	<sup>3</sup> credits must be one of the following: MATH 307, MATH 356, or MATH 425.	9-10
	Credits	15-16
<b>Spring</b>		
PHYS 441	Quantum Mechanics	4
PHYS 493	Seminar	1
PHYS 499	Thesis Research	1
Elective		6
	Credits	12
	Total Credits	119-122