MAJOR IN PHYSICS, PHYSICS CONCENTRATION

The Physics concentration provides a broad background in physics that serves as a base for later specialization, either in graduate school or on the job. It is designed for those seeking greater insight into physics and an introduction to more advanced topics and methods. Students who obtain a degree in Physics with the Physics concentration are prepared for a career in industry or government, or for advanced study at the graduate level.

Requirements Effective Fall 2023

Each course used to meet requirements of the concentration need a minimum grade of C-, including courses to satisfy AUCC Categories 1, 2, and 3A.

Freshman

		AUCC	Credits
CO 150	College Composition (GT-CO2)	1A	3
Select one of the following groups:			5
CS 150B	Culture and Coding: Python (GT-AH3)	3B	
Electives			
or			
CS 152	Python for STEM		
Arts and Humanities (https://catalog.colostate.edu/general-catalog/all-university-core-curriculum/aucc/#arts-humanities)		3B	
MATH 160	Calculus for Physical Scientists I (GT-MA1)	1B	4
MATH 161	Calculus for Physical Scientists II (GT-MA1)	1B	4
PH 141	Physics for Scientists and Engineers I (GT-SC1)	3A	5
PH 142	Physics for Scientists and Engineers II (GT-SC1)	3A	5
PH 193	Introductory Seminar in Physics		1
1C (https://catalog.colostate.edu/general-catalog/all-university-core-curriculum/aucc/#aucc)		1C	3
	Total Credits		**30**

Sophomore

MATH 261	Calculus for Physical Scientists III		4
Select one from the following:			4
MATH 340	Intro to Ordinary Differential Equations		
MATH 345	Differential Equations		
PH 210	Introduction to Computing in Physics		3
PH 245[1]	Introduction to Electronics		3
PH 293	Selected Topics in Physics		1
PH 314	Introduction to Modern Physics		4
PH 315	Modern Physics Laboratory		2
Arts and Humanities (https://catalog.colostate.edu/general-catalog/all-university-core-curriculum/aucc/#arts-humanities)		3B	3
Historical Perspectives (https://catalog.colostate.edu/general-catalog/all-university-core-curriculum/aucc/#historical-perspectives)		3D	3
Social and Behavioral Sciences (https://catalog.colostate.edu/general-catalog/all-university-core-curriculum/aucc/#social-behavioral-sciences)		3C	3
	Total Credits		**30**

Junior

Select one from the following:[2]			3
CHEM 301	Advanced Scientific Writing--Chemistry (GT-CO3)	2	
CO 300	Writing Arguments (GT-CO3)	2	
CO 301B	Writing in the Disciplines: Sciences (GT-CO3)	2	
JTC 300	Strategic Writing and Communication (GT-CO3)	2	
LB 300	Specialized Professional Writing	2	

MATH 369	Linear Algebra I		3
PH 341	Mechanics		4
PH 351[1]	Electricity and Magnetism		4
PH 353	Optics and Waves		4
PH 361	Physical Thermodynamics		3
Mathematics and Statistics List (select a minimum of 3 credits)			3
Electives[3]			6
	Total Credits		**30**
Senior			
PH 425	Advanced Physics Laboratory	4C	2
PH 451	Introductory Quantum Mechanics I	4A,4B	3
PH 452	Introductory Quantum Mechanics II		3
PH 462	Statistical Physics		3
PH 492	Seminar	4C	1
Technical Course List (select at least two courses from the list below)			6
Electives[3]			12
	Total Credits		**30**
	Program Total Credits:		**120**

Mathematics and Statistics List (select a minimum of 3 credits)

Code	Title	Credits
MATH 317	Advanced Calculus of One Variable	3
MATH 332	Partial Differential Equations	3
MATH 366	Introduction to Abstract Algebra	3
MATH 419	Introduction to Complex Variables	3
MATH 430/ECE 430	Fourier and Wavelet Analysis with Apps	3
MATH 466	Abstract Algebra I	3
MATH 469	Linear Algebra II	3
MATH 472	Introduction to Topology	3
MATH 474	Introduction to Differential Geometry	3
PH 571	Mathematical Methods for Physics I	3
STAT 315	Intro to Theory and Practice of Statistics	3
STAT 420	Probability and Mathematical Statistics I	3

Technical Course List (select a minimum of 6 credits from a minimum of 2 courses not taken elsewhere in the program)

Code	Title	Credits
ATS 550	Atmospheric Radiation and Remote Sensing	3
BC 411	Physical Biochemistry	4
CBE 331	Momentum Transfer and Mechanical Separations	3
CBE 332	Heat and Mass Transfer Fundamentals	3
CHEM 111	General Chemistry I (GT-SC2)	4
CHEM 112	General Chemistry Lab I (GT-SC1)	1
CHEM 113	General Chemistry II	3
CHEM 114	General Chemistry Lab II	1
CHEM 120	Foundations of Modern Chemistry (GT-SC2)	4
CHEM 121	Foundations of Modern Chemistry Laboratory (GT-SC1)	1
CHEM 231	Foundations of Analytical Chemistry	3
CHEM 241	Foundations of Organic Chemistry	4
CHEM 245	Fundamentals of Organic Chemistry	4
CHEM 263	Foundations of Inorganic Chemistry	4
CHEM 341	Modern Organic Chemistry I	3
CHEM 345	Organic Chemistry I	4
CHEM 474	Physical Chemistry I	3
CIVE 300	Fluid Mechanics	3
CIVE 301	Fluid Mechanics Laboratory	1
CS 220	Discrete Structures and the Applications [4]	4
CS 270	Computer Organization [4]	4
CS 320	Algorithms--Theory and Practice	3
CS 345	Machine Learning Foundations and Practice	3
ECE 312	Linear System Analysis II	3
ECE 331	Electronics Principles I	4
ECE 332	Electronics Principles II	4
ECE 404	Experiments in Optical Electronics	2
ECE 415	Semiconductor Physics and Junctions	2
ECE 441	Optical Electronics	3
ECE 444	Antennas and Radiation	3
ECE 507	Plasma Physics and Applications	3
ECE 546	Laser Fundamentals and Devices	3
ERHS 450	Introduction to Radiation Biology	3
ERHS 530	Radiological Physics and Dosimetry I	3
ERHS 531	Nuclear Instruments and Measurements	2
GEOL 578	Global Seismology	4
MATH 317	Advanced Calculus of One Variable	3
MATH 332	Partial Differential Equations	3
MATH 366	Introduction to Abstract Algebra	3
MATH 405	Introduction to Number Theory	3
MATH 419	Introduction to Complex Variables	3

MATH 430/ECE 430	Fourier and Wavelet Analysis with Apps	3
MATH 450	Introduction to Numerical Analysis I	3
MATH 451	Introduction to Numerical Analysis II	3
MATH 466	Abstract Algebra I	3
MATH 467	Abstract Algebra II	3
MATH 469	Linear Algebra II	3
MATH 472	Introduction to Topology	3
MATH 474	Introduction to Differential Geometry	3
MECH 331	Introduction to Engineering Materials	4
MECH 344	Heat and Mass Transfer	3
MECH 460	Aeronautics	3
MECH 468	Space Propulsion and Power Engineering	3
MECH 518	Orbital Mechanics	3
PH 498	Research [4]	1-6
PH 517	Chaos, Fractals, and Nonlinear Dynamics	3
PH 521	Introduction to Lasers	3
PH 522	Introductory Laser Laboratory	1
PH 531	Introductory Condensed Matter Physics	3
PH 561	Elementary Particle Physics	3
PH 571	Mathematical Methods for Physics I	3
STAT 315	Intro to Theory and Practice of Statistics	3
STAT 341	Statistical Data Analysis I	3
STAT 400	Statistical Computing	3
STAT 420	Probability and Mathematical Statistics I	3
STAT 421	Introduction to Stochastic Processes	3
STAT 430	Probability and Mathematical Statistics II	3
STAT 440	Bayesian Data Analysis	3
STAT 460	Applied Multivariate Analysis	3

1 For students who change majors from Electrical Engineering or are double-majoring in Electrical Engineering, please see advisor for possible substitutions.

2 CHEM 301 and CO 301B are recommended. Other courses in All-University Core Curriculum (AUCC) Category 2 may be accepted as substitutes if they are taken prior to declaring the Physics major or are taken to meet requirements of another major.

3 Select enough elective credits to bring the program total to a minimum of 120 credits, of which at least 42 must be upper-division (300-, 400-level).

4 Only 3 credits from this course are applied towards the Technical Electives requirement.

Major Completion Map

Distinctive Requirements for Degree Program:

Required PH courses above the 100-Level are typically offered only Fall or Spring, not both. A grade of C- or better is required in all courses used to meet requirements of the major, except for unrestricted electives and courses taken to satisfy All-University Core Curriculum (AUCC) categories 1A, 1C, 3B, 3C, and 3D.

Freshman

Semester 1		**Critical**	**Recommended**	**AUCC**	**Credits**
CO 150	College Composition (GT-CO2)		X	1A	3
MATH 160	Calculus for Physical Scientists I (GT-MA1)		X	1B	4
PH 141	Physics for Scientists and Engineers I (GT-SC1)		X	3A	5
PH 193	Introductory Seminar in Physics				1
1C (https://catalog.colostate.edu/general-catalog/all-university-core-curriculum/aucc/#aucc)				1C	3
	Total Credits				**16**
Semester 2		**Critical**	**Recommended**	**AUCC**	**Credits**
Select one group from the following:					3-5
Group A:					
CS 150B	Culture and Coding: Python (GT-AH3)			3B	
Electives					
Group B:					
CS 152	Python for STEM				
Arts and Humanities (https://catalog.colostate.edu/general-catalog/all-university-core-curriculum/aucc/#arts-humanities)				3B	
MATH 161	Calculus for Physical Scientists II (GT-MA1)		X	1B	4
PH 142	Physics for Scientists and Engineers II (GT-SC1)		X	3A	5
CS 150B, MATH 160, and PH 141 must be completed by the end of Semester 2.		X			
	Total Credits				**14**

Sophomore

Semester 3		**Critical**	**Recommended**	**AUCC**	**Credits**
MATH 261	Calculus for Physical Scientists III		X		4
PH 210	Introduction to Computing in Physics				3

PH 245	Introduction to Electronics				3
PH 293	Selected Topics in Physics				1
Historical Perspectives (https://catalog.colostate.edu/general-catalog/all-university-core-curriculum/aucc/#historical-perspectives)				3D	3
MATH 161 and PH 142 must be completed by the end of Semester 3.		X			
	Total Credits				**14**
Semester 4		**Critical**	**Recommended**	**AUCC**	**Credits**
Select one course from the following:					4
MATH 340	Intro to Ordinary Differential Equations		X		
MATH 345	Differential Equations				
PH 314	Introduction to Modern Physics		X		4
PH 315	Modern Physics Laboratory		X		2
Arts and Humanities (https://catalog.colostate.edu/general-catalog/all-university-core-curriculum/aucc/#arts-humanities)				3B	3
Social and Behavioral Sciences (https://catalog.colostate.edu/general-catalog/all-university-core-curriculum/aucc/#social-behavioral-sciences)				3C	3
MATH 261 must be completed by the end of Semester 4.		X			
	Total Credits				**16**
Junior					
Semester 5		**Critical**	**Recommended**	**AUCC**	**Credits**
MATH 369	Linear Algebra I				3
PH 341	Mechanics		X		4
PH 353	Optics and Waves		X		4
Mathematics and Statistics List (Select a minimum of 3 credits from List on Concentration Requirements Tab)					3
MATH 340 and PH 245 must be completed by the end of Semester 5.		X			
	Total Credits				**14**
Semester 6		**Critical**	**Recommended**	**AUCC**	**Credits**
PH 351	Electricity and Magnetism		X		4
PH 361	Physical Thermodynamics	X			3
Select one course from the following:					3
CHEM 301	Advanced Scientific Writing–Chemistry (GT-CO3)			2	
CO 300	Writing Arguments (GT-CO3)			2	
CO 301B	Writing in the Disciplines: Sciences (GT-CO3)			2	
LB 300	Specialized Professional Writing			2	
Elective					6
PH 293, PH 314, and PH 315 must be completed by the end of Semester 6.		X			
	Total Credits				**16**
Senior					
Semester 7		**Critical**	**Recommended**	**AUCC**	**Credits**
PH 451	Introductory Quantum Mechanics I	X		4A,4B	3
PH 462	Statistical Physics	X			3
Technical Course List (See Technical Course List on Concentration Requirements Tab)					3
Electives					6
PH 341 and PH 353 must be completed by the end of Semester 7.		X			
	Total Credits				**15**
Semester 8		**Critical**	**Recommended**	**AUCC**	**Credits**
PH 425	Advanced Physics Laboratory	X		4C	2
PH 452	Introductory Quantum Mechanics II	X			3
PH 492	Seminar	X		4C	1
Technical Course List (See Technical Course List on Concentration Requirements Tab)		X			3

Electives	X	6
The benchmark courses for the 8th semester are the remaining courses in the entire program of study.	X	
Total Credits		**15**
Program Total Credits:		**120**