BS IN PHYSICS

The B.S. in Physics requires a minimum of 120 hours of coursework and provides a strong background in basic physics while preparing students to prepare for jobs in industry or pursue graduate education.

The B.S. degree in physics requires completion of a common core of 34 hours of physics courses and 29 hours of related-area courses and a choice of one concentration with additional requirements as listed below. The concentrations contain an additional 6-20 hours of physics, astronomy and related courses.

Recommended Introductory Course
PHYS 1910 Frontiers Of Physics And Astronomy (strongly recommended)

Completion of one of the following concentrations is required:

- Physics -Physics Concentration, BS (p. 1)
- Physics -Applied Physics Concentration, BS
- Physics -Astrophysics Concentration, BS
- Physics -Medical Physics Concentration, BS

Physics -Physics Concentration, BS

Code	Title	Hours
B.S. Degree in Physics		
The B.S. degree in physics requires completion of a common core of 34 hours of physics courses and 29 hours of related-area courses and a choice of one concentration with additional requirements as listed below. The concentrations contain an additional 6-20 hours of physics, astronomy and related courses.		
Recommended Introductory Course		
PHYS 1910	Frontiers Of Physics And Astronomy (Strongly recommended)	3
Required Core Physics Courses		
PHYS 2130	Physics For Science And Engineering Majors I Or with approval, PHYS 2070 plus PHYS 2100	5
PHYS 2140	Physics For Science And Engineering Majors II Or with approval, PHYS 2080 plus PHYS 2100	5
PHYS 3310	Modern Physics I	3
PHYS 3410	Thermal Physics	3
PHYS 4210	Theoretical Mechanics	3
PHYS 4230	Electricity And Magnetism I	3
PHYS 4240	Electricity And Magnetism II	3
PHYS 4310	Quantum Mechanics	3
PHYS 4910	Research Problems-Physics And Astronomy 1-3 hrs in each of two semester	4
PHYS 4920	Senior Capstone Project	1
PHYS 4950	Undergraduate Professional Development Seminar	1
The following related courses are also required:		
CHEM 1230	General Chemistry I	4
CHEM 1280	General Chemistry Lab I	1
One of the following		3
CSET 1100	Introduction to Computer Science and Engineering Technology	
EECS 1500	Introduction to Programming	
PHYS 4130	Computational Physics	
MATH 1830	Calculus I For Mathematicians, Scientists And Educators	4
or MATH 1850	Single Variable Calculus I	
MATH 1840	Calculus II For Mathematicians, Scientists And Educators	4
or MATH 1860	Single Variable Calculus II	
MATH 1890	Elementary Linear Algebra	3
or MATH 2890	Numerical Methods And Linear Algebra	
MATH 2850	Elementary Multivariable Calculus	4
MATH 2860	Elementary Differential Equations	3
MATH 3610	Statistical Methods I	3
One additional course chosen from major-level courses in biology, chemistry, or environmental sciences (3-4 hrs)		3
Required Courses for Physics Concentration		
PHYS 3180	Intermediate Laboratory	3
PHYS 4580	Molecular And Condensed Matter Laboratory	3
or PHYS 4780	Atomic And Nuclear Physics Laboratory	
In addition to the above requirements, students should consider the following recommended elective courses:		
MATH 4740	Advanced Applied Mathematics I	3
MATH 4750	Advanced Applied Mathematics II	3

Physics -Astrophysics Concentration, BS

Code	Title	Hours
B.S. Degree in Physics		
The B.S. degree in physics requires completion of a common core of 34 hours of physics courses and 29 hours of related-area courses and a choice of one concentration with additional requirements as listed below. The concentrations contain an additional 6-20 hours of physics, astronomy and related courses.		
Recommended Introductory Course		
PHYS 1910	Frontiers Of Physics And Astronomy (Strongly recommended)	3
Required Core Physics Courses		
PHYS 2130	Physics For Science And Engineering Majors I Or with approval, PHYS 2070 plus PHYS 2100	5
PHYS 2140	Physics For Science And Engineering Majors II Or with approval, PHYS 2080 plus PHYS 2100	5
PHYS 3310	Modern Physics I	3
PHYS 3410	Thermal Physics	3
PHYS 4210	Theoretical Mechanics	3
PHYS 4230	Electricity And Magnetism I	3
PHYS 4240	Electricity And Magnetism II	3
PHYS 4310	Quantum Mechanics	3
PHYS 4910	Research Problems-Physics And Astronomy 1-3 hrs in each of two semesters	4
PHYS 4920	Senior Capstone Project	1

PHYS 4950	Undergraduate Professional Development Seminar	1
The following related courses are also required:		
CHEM 1230	General Chemistry I	4
CHEM 1280	General Chemistry Lab I	1
One of the following		3
CSET 1100	Introduction to Computer Science and Engineering Technology	
EECS 1500	Introduction to Programming	
PHYS 4130	Computational Physics	
MATH 1830	Calculus I For Mathematicians, Scientists And Educators	4
or MATH 1850	Single Variable Calculus I	
MATH 1840	Calculus II For Mathematicians, Scientists And Educators	4
or MATH 1860	Single Variable Calculus II	
MATH 1890	Elementary Linear Algebra	3
or MATH 2890	Numerical Methods And Linear Algebra	
MATH 2850	Elementary Multivariable Calculus	4
MATH 2860	Elementary Differential Equations	3
MATH 3610	Statistical Methods I	3
One additional course chosen from major-level courses in biology, chemistry, or environmental sciences (3-4 hrs)		3
Required Courses for the Astrophysics Concentration		
ASTR 2010	Solar System Astronomy	3
ASTR 2020	Stars, Galaxies, And The Universe	3
ASTR 3880	Foundations of Astronomy	4
ASTR 4810	Astrophysics I	3
ASTR 4820	Astrophysics II	3
ASTR 4880	Astrophysical Measurements	3
In addition to the above requirements, students should select CSET 1100 as the programming course, and consider the following two recommended elective math courses:		
MATH 4740	Advanced Applied Mathematics I	3
MATH 4750	Advanced Applied Mathematics II	3

Physics -Applied Physics Concentration, BS

Code	Title	Hours
B.S. Degree in Physics		
The B.S. degree in physics requires completion of a common core of 34 hours of physics courses and 29 hours of related-area courses and a choice of one concentration with additional requirements as listed below. The concentrations contain an additional 6-20 hours of physics, astronomy and related courses.		
Recommended Introductory Course		
PHYS 1910	Frontiers Of Physics And Astronomy (Strongly recommended)	3
Required Core Physics Courses		
PHYS 2130	Physics For Science And Engineering Majors I Or with approval, PHYS 2070 plus PHYS 2100	5
PHYS 2140	Physics For Science And Engineering Majors II Or with approval, PHYS 2080 plus PHYS 2100	5
PHYS 3310	Modern Physics I	3
PHYS 3410	Thermal Physics	3
PHYS 4210	Theoretical Mechanics	3
PHYS 4230	Electricity And Magnetism I	3
PHYS 4240	Electricity And Magnetism II	3
PHYS 4310	Quantum Mechanics	3
PHYS 4910	Research Problems-Physics And Astronomy 1-3 hrs in each of two semesters	4
PHYS 4920	Senior Capstone Project	1
PHYS 4950	Undergraduate Professional Development Seminar	1
The following related courses are also required:		
CHEM 1230	General Chemistry I	4
CHEM 1280	General Chemistry Lab I	1
One of the following		3
CSET 1100	Introduction to Computer Science and Engineering Technology	
EECS 1500	Introduction to Programming	
PHYS 4130	Computational Physics	
MATH 1830	Calculus I For Mathematicians, Scientists And Educators	4
or MATH 1850	Single Variable Calculus I	
MATH 1840	Calculus II For Mathematicians, Scientists And Educators	4
or MATH 1860	Single Variable Calculus II	
MATH 1890	Elementary Linear Algebra	3
or MATH 2890	Numerical Methods And Linear Algebra	
MATH 2850	Elementary Multivariable Calculus	4
MATH 2860	Elementary Differential Equations	3
MATH 3610	Statistical Methods I	3
One additional course chosen from major-level courses in biology, chemistry, or environmental sciences (3-4 Hrs)		3
Required Courses for Applied Physics Concentration		
PHYS 3180	Intermediate Laboratory	3
PHYS 3610	Optics And Lasers	3
PHYS 4510	Physics Of Condensed Matter	3
PHYS 4580	Molecular And Condensed Matter Laboratory	3
or PHYS 4780	Atomic And Nuclear Physics Laboratory	
Additional courses from physics or engineering, chosen with the advisor's approval		3
In addition to the above requirements, students should consider the following recommended elective courses:		
MATH 4740	Advanced Applied Mathematics I	3
MATH 4750	Advanced Applied Mathematics II	3

Physics -Medical Physics Concentration, BS

Code	Title	Hours
B.S. Degree in Physics		
The B.S. degree in physics requires completion of a common core of 34 hours of physics courses and 29 hours of related-area courses and a choice of one concentration with additional requirements as listed below. The concentrations contain an additional 6-20 hours of physics, astronomy and related courses.		
Recommended Introductory Course		

PHYS 1910	Frontiers Of Physics And Astronomy (Strongly recommended)	3
Required Core Physics Courses		
PHYS 2130	Physics For Science And Engineering Majors I [Or] with approval, PHYS 2070 plus PHYS 2100	5
PHYS 2140	Physics For Science And Engineering Majors II [Or] with approval, PHYS 2080 plus PHYS 2100	5
PHYS 3310	Modern Physics I	3
PHYS 3410	Thermal Physics	3
PHYS 4210	Theoretical Mechanics	3
PHYS 4230	Electricity And Magnetism I	3
PHYS 4240	Electricity And Magnetism II	3
PHYS 4310	Quantum Mechanics	3
PHYS 4910	Research Problems-Physics And Astronomy [1-3 hrs] in each of two semesters	4
PHYS 4920	Senior Capstone Project	1
PHYS 4950	Undergraduate Professional Development Seminar	1
The following related courses are also required:		
CHEM 1230	General Chemistry I	4
CHEM 1280	General Chemistry Lab I	1
EECS 1500	Introduction to Programming	3
or PHYS 4130	Computational Physics	
or CSET 1100	Introduction to Computer Science and Engineering Technology	
MATH 1830	Calculus I For Mathematicians, Scientists And Educators	4
or MATH 1850	Single Variable Calculus I	
MATH 1840	Calculus II For Mathematicians, Scientists And Educators	4
or MATH 1860	Single Variable Calculus II	
MATH 1890	Elementary Linear Algebra	3
or MATH 2890	Numerical Methods And Linear Algebra	
MATH 2850	Elementary Multivariable Calculus	4
MATH 2860	Elementary Differential Equations	3
MATH 3610	Statistical Methods I	3
One additional course chosen from major-level courses in biology, chemistry, or environmental sciences (3-4 hrs)		3
Required Courses for Medical Physics Concentration		
PHYS 3180	Intermediate Laboratory	3
PHYS 4430	Medical Physics I	3
PHYS 4440	Medical Physics II	3
PHYS 4580	Molecular And Condensed Matter Laboratory	3
or PHYS 4780	Atomic And Nuclear Physics Laboratory	
BIOL 2150	Fundamentals Of Life Science: Diversity Of Life, Evolution And Adaptation	4
BIOL 2160	Fundamentals Of Life Science Laboratory: Diversity Of Life, Evolution And Adaptation	1
EXSC 2510	Human Anatomy	3
EXSC 2520	Human Anatomy Lab	1
EXSC 2530	Human Physiology	3
EXSC 2540	Human Physiology Lab	1

In addition to the above requirements, students should consider the following two recommended elective math courses:

MATH 4740	Advanced Applied Mathematics I	3
MATH 4750	Advanced Applied Mathematics II	3

Below are sample plans of study for the four concentrations. Consult your degree audit for your program reqirements.

- Physics -Physics Concentration, BS
- Physics -Applied Physics Concentration, BS
- Physics -Astrophysics Concentration, BS
- Physics -Medical Physics Concentration, BS

Physics -Physics Concentration, BS

First Year

First Term		**Hours**
NSM 1000	Natural Sciences & Mathematics	2
PHYS 1910	Frontiers Of Physics And Astronomy	3
PHYS 2130	Physics For Science And Engineering Majors I	5
MATH 1830 or MATH 1850	Calculus I For Mathematicians, Scientists And Educators or Single Variable Calculus I	4
ENGL 1110	College Composition I	3
	Hours	**17**
Second Term		
PHYS 2140	Physics For Science And Engineering Majors II	5
MATH 1840 or MATH 1860	Calculus II For Mathematicians, Scientists And Educators or Single Variable Calculus II	4
MATH 1890 or MATH 2890	Elementary Linear Algebra (Or Math 2890) or Numerical Methods And Linear Algebra	3
ENGL 1130	College Composition II: Academic Disciplines And Discourse	3
	Hours	**15**

Second Year

First Term		
PHYS 3310	Modern Physics I	3
CHEM 1230	General Chemistry I	4
CHEM 1280	General Chemistry Lab I	1
MATH 2850	Elementary Multivariable Calculus	4
MATH 3610	Statistical Methods I	3
	Hours	**15**
Second Term		
PHYS 3180	Intermediate Laboratory	3
PHYS 3410	Thermal Physics	3
MATH 2860	Elementary Differential Equations	3
EECS 1500	Introduction to Programming	3
Social Sciences Core		3
	Hours	**15**

Third Year

First Term

PHYS 4210	Theoretical Mechanics	3
PHYS 4230	Electricity And Magnetism I	3
Arts/Humanities Core		3
Writing Across the Curriculum (WAC) Non-Physics		3
Non-US Diversity		3
	Hours	**15**

Second Term

PHYS 4240	Electricity And Magnetism II	3
PHYS 4310	Quantum Mechanics	3
Select one in Major Level BIOL, EEES, eg [3-4 hours depending on course selection]		3
BIOL 2150	Fundamentals Of Life Science: Diversity Of Life, Evolution And Adaptation	
BIOL 2170	Fundamentals of Life Science: Biomolecules, Cells, and Inheritance	
EEES 2010	Introduction To Environmental Studies	
EEES 2100	Fundamentals Of Geology	
EEES 2150	Biodiversity	
Diversity of US		3
Social Sciences Core		3
	Hours	**15**

Fourth Year

First Term

PHYS 4580 or PHYS 4780	Molecular And Condensed Matter Laboratory or Atomic And Nuclear Physics Laboratory	3
PHYS 4910	Research Problems-Physics And Astronomy [(1-3 hrs)]	2
PHYS 4950	Undergraduate Professional Development Seminar	1
Arts/Humanities Core		3
Electives		6
	Hours	**15**

Second Term

PHYS 4910	Research Problems-Physics And Astronomy	2
PHYS 4920	Senior Capstone Project	1
Electives		10
	Hours	**13**
	Total Hours	**120**

Physics -Applied Physics Concentration, BS

First Year

First Term

		Hours
NSM 1000	Natural Sciences & Mathematics	2
PHYS 1910	Frontiers Of Physics And Astronomy	3
PHYS 2130	Physics For Science And Engineering Majors I	5
MATH 1830 or MATH 1850	Calculus I For Mathematicians, Scientists And Educators or Single Variable Calculus I	4
ENGL 1110	College Composition I	3
	Hours	**17**

Second Term

PHYS 2140	Physics For Science And Engineering Majors II	5
MATH 1840 or MATH 1860	Calculus II For Mathematicians, Scientists And Educators or Single Variable Calculus II	4
MATH 1890 or MATH 2890	Elementary Linear Algebra or Numerical Methods And Linear Algebra	3
ENGL 1130	College Composition II: Academic Disciplines And Discourse	3
	Hours	**15**

Second Year

First Term

PHYS 3310	Modern Physics I	3
CHEM 1230	General Chemistry I	4
CHEM 1280	General Chemistry Lab I	1
MATH 2850	Elementary Multivariable Calculus	4
MATH 3610	Statistical Methods I	3
	Hours	**15**

Second Term

PHYS 3180	Intermediate Laboratory	3
PHYS 3410	Thermal Physics	3
MATH 2860	Elementary Differential Equations	3
EECS 1500	Introduction to Programming	3
Social Sciences Core		3
	Hours	**15**

Third Year

First Term

PHYS 4210	Theoretical Mechanics	3
PHYS 4230	Electricity And Magnetism I	3
Arts/Humanities Core		3
Writing Across the Curriculum (WAC) Non-Physics course		3
Non-US Diversity		3
	Hours	**15**

Second Term

PHYS 4240	Electricity And Magnetism II	3
PHYS 4310	Quantum Mechanics	3
Select one in Major Level BIOL, EEES, eg [3-4 hours depending on course selection]		3
BIOL 2150	Fundamentals Of Life Science: Diversity Of Life, Evolution And Adaptation	
BIOL 2170	Fundamentals of Life Science: Biomolecules, Cells, and Inheritance	
EEES 2010	Introduction To Environmental Studies	
EEES 2100	Fundamentals Of Geology	

EEES 2150	Biodiversity	
Diversity of US		3
Social Sciences Core		3
	Hours	**15**
Fourth Year		
First Term		
PHYS 3610	Optics And Lasers	3
PHYS 4510	Physics Of Condensed Matter	3
PHYS 4910	Research Problems-Physics And Astronomy (1-3 hrs)	2
PHYS 4950	Undergraduate Professional Development Seminar	1
Arts/Humanities Core		3
Electives		3
	Hours	**15**
Second Term		
PHYS 4580 or PHYS 4780	Molecular And Condensed Matter Laboratory or Atomic And Nuclear Physics Laboratory	3
PHYS 4910	Research Problems-Physics And Astronomy (1-3 hrs)	2
PHYS 4920	Senior Capstone Project	1
Electives		4
Physics or Eng 3000/4000 Level		3
	Hours	**13**
	Total Hours	**120**

Physics -Astrophysics Concentration, BS

First Year		
First Term		**Hours**
NSM 1000	Natural Sciences & Mathematics	2
PHYS 1910	Frontiers Of Physics And Astronomy	3
PHYS 2130	Physics For Science And Engineering Majors I	5
ASTR 2010	Solar System Astronomy	3
MATH 1830 or MATH 1850	Calculus I For Mathematicians, Scientists And Educators or Single Variable Calculus I	4
	Hours	**17**
Second Term		
PHYS 2140	Physics For Science And Engineering Majors II	5
ASTR 2020	Stars, Galaxies, And The Universe	3
MATH 1840 or MATH 1860	Calculus II For Mathematicians, Scientists And Educators or Single Variable Calculus II	4
ENGL 1110	College Composition I	3
	Hours	**15**
Second Year		
First Term		
PHYS 3310	Modern Physics I	3
CHEM 1230	General Chemistry I	4
CHEM 1280	General Chemistry Lab I	1
MATH 2850	Elementary Multivariable Calculus	4
MATH 3610	Statistical Methods I	3
CSET 1100	Introduction to Computer Science and Engineering Technology	3
	Hours	**18**
Second Term		
ASTR 3880	Foundations of Astronomy	4
MATH 1890 or MATH 2890	Elementary Linear Algebra or Numerical Methods And Linear Algebra	3
MATH 2860	Elementary Differential Equations	3
ENGL 1130	College Composition II: Academic Disciplines And Discourse	3
	Hours	**13**
Third Year		
First Term		
PHYS 4210	Theoretical Mechanics	3
PHYS 4230	Electricity And Magnetism I	3
Select one in Major Level BIOL, EEES, eg (3-4 hours depending on course selection)		3
BIOL 2150	Fundamentals Of Life Science: Diversity Of Life, Evolution And Adaptation	
BIOL 2170	Fundamentals of Life Science: Biomolecules, Cells, and Inheritance	
EEES 2010	Introduction To Environmental Studies	
EEES 2100	Fundamentals Of Geology	
EEES 2150	Biodiversity	
Writing Across the Curriculum (WAC) Non-Physics		3
Non-US Diversity		3
	Hours	**15**
Second Term		
PHYS 3410	Thermal Physics	3
PHYS 4240	Electricity And Magnetism II	3
PHYS 4310	Quantum Mechanics	3
Diversity of US		3
Social Sciences Core		3
	Hours	**15**
Fourth Year		
First Term		
ASTR 4810	Astrophysics I	3
ASTR 4880	Astrophysical Measurements	3
PHYS 4910	Research Problems-Physics And Astronomy (1-3 hrs)	2
PHYS 4950	Undergraduate Professional Development Seminar	1
Arts/Humanities Core		3

Elective		3
	Hours	**15**
Second Term		
ASTR 4820	Astrophysics II	3
PHYS 4910	Research Problems-Physics And Astronomy [1-3 hrs]	2
PHYS 4920	Senior Capstone Project	1
Arts/Humanities Core		3
Social Sciences Core		3
	Hours	**12**
	Total Hours	**120**

Physics -Medical Physics Concentration, BS

First Year		
First Term		**Hours**
NSM 1000	Natural Sciences & Mathematics	2
PHYS 1910	Frontiers Of Physics And Astronomy	3
PHYS 2130	Physics For Science And Engineering Majors I	5
MATH 1830 or MATH 1850	Calculus I For Mathematicians, Scientists And Educators or Single Variable Calculus I	4
ENGL 1110	College Composition I	3
	Hours	**17**
Second Term		
PHYS 2140	Physics For Science And Engineering Majors II	5
MATH 1840 or MATH 1860	Calculus II For Mathematicians, Scientists And Educators or Single Variable Calculus II	4
MATH 1890 or MATH 2890	Elementary Linear Algebra or Numerical Methods And Linear Algebra	3
ENGL 1130	College Composition II: Academic Disciplines And Discourse	3
	Hours	**15**
Second Year		
Third Term		
PHYS 3310	Modern Physics I	3
CHEM 1230	General Chemistry I	4
CHEM 1280	General Chemistry Lab I	1
MATH 2850	Elementary Multivariable Calculus	4
MATH 3610	Statistical Methods I	3
	Hours	**15**
Fourth Term		
PHYS 3180	Intermediate Laboratory	3
PHYS 3410	Thermal Physics	3
MATH 2860	Elementary Differential Equations	3
EECS 1500	Introduction to Programming	3
Social Science Core		3
	Hours	**15**
Third Year		
Fifth Term		
PHYS 4210	Theoretical Mechanics	3
PHYS 4230	Electricity And Magnetism I	3
Arts/Humanities Core		3
Writing Across Curriculum (WAC) non-physics		3
Non-US Diversity		3
	Hours	**15**
Sixth Term		
PHYS 4240	Electricity And Magnetism II	3
PHYS 4310	Quantum Mechanics	3
Diversity of US		3
BIOL 2150	Fundamentals Of Life Science: Diversity Of Life, Evolution And Adaptation	4
BIOL 2160	Fundamentals Of Life Science Laboratory: Diversity Of Life, Evolution And Adaptation	1
	Hours	**14**
Fourth Year		
Seventh Term		
PHYS 4430	Medical Physics I	3
PHYS 4580 or PHYS 4780	Molecular And Condensed Matter Laboratory or Atomic And Nuclear Physics Laboratory	3
PHYS 4910	Research Problems-Physics And Astronomy [1-3 hrs]	2
PHYS 4950	Undergraduate Professional Development Seminar	1
EXSC 2510	Human Anatomy	3
EXSC 2520	Human Anatomy Lab	1
Arts/Humanities Core		3
	Hours	**16**
Eighth Term		
PHYS 4440	Medical Physics II	3
PHYS 4910	Research Problems-Physics And Astronomy [1-3 hrs]	2
PHYS 4920	Senior Capstone Project	1
EXSC 2530	Human Physiology	3
EXSC 2540	Human Physiology Lab	1
Social Sciences Core		3
	Hours	**13**
	Total Hours	**120**

Learning Outcomes

- PLO 1. analyze which physical processes are relevant to a given system;
- PLO 2. assess cause and effect in physical systems by formulating evidence-based logical arguments;
- PLO 3. solve (using the appropriate mathematical techniques) any advanced undergraduate problem from the core areas of physics (Newtonian mechanics, electromagnetism, statistical

mechanics, quantum theory, and relativity) as well as the area of their concentration;

- PLO 4. perform experiments to measure physical properties of interest and evaluate their observations, including estimating the uncertainties associated with their measurements;
- PLO 5. practice oral and written communication skills appropriate to their concentration;
- PLO 6. determine relevant informational resources appropriate to their concentration;
- PLO 7. demonstrate ethical scientific and academic conduct;
- PLO 8. apply collaboration skills in a scientific context.