## **PHYSICS COMPREHENSIVE, BACHELOR OF SCIENCE**

Offered by Department of Physics and Astronomy (http:// catalog.unk.edu/undergraduate/departments-programs/physicsastronomy/)

Code	Title	Credit Hours
General Educatio	n	
Foundational Req	uirements (LOPERs 1-4)	14
Including:		
LOPER 4: Mather Reasoning	natics, Statistics, and Quantitative	
MATH 115	Calculus I with Analytic Geometry <sup>1</sup>	
Broad Knowledge	Requirements (LOPERs 5-8)	11
Including:		
Take any one coustisfies a Dispose 10) and a Broad H meet these criter undergraduate/g knowledge-dispo undergraduate/g knowledge-dispo	urse in LOPER 5, LOPER 6, or LOPER 7 that sitional Requirement (LOPER 9 or LOPER Knowledge Requirement. The courses that ia are listed at https://catalog.unk.edu/ eneral-studies/courses-satisfy-broad- sitional (https://catalog.unk.edu/ eneral-studies/courses-satisfy-broad- sitional/)/. See advisor for assistance.	
LOPER 8: Natural	Sciences	
PHYS 275	General Physics I (Calculus)	
PHYS 275L	General Physics I (Calculus) Laboratory	
Dispositional Requ	uirements (LOPERs 9-10) <sup>2</sup>	6
Wellness (LOPER	11) Optional	0
BS Science-relate	ed course requirements	8
MATH 202	Calculus II with Analytic Geometry	
MATH 305	Differential Equations	
Program Specifie	ed Requirements	5
PHYS 276	General Physics II (Calculus)	
PHYS 276L	General Physics II (Calculus) Laboratory	
Major Option		
Complete all requ	uired courses	56-62
Unrestricted elec	tives	
Needed to reach	120 credit hour minimum	14-20
Total Credit Hour	S	120
Major Opt	ion	

## major uption

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Code
                  Title
                                                                  Credit
                                                                  Hours
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Physics Comprehensive Core Requirements
PHYS 346
                Modern Physics I
                                                                 4
PHYS 410
                Mathematical Techniques in Physics I
                                                                 3
Physics Comprehensive Math Requirements
MATH 260
                Calculus III
                                                                 5
Physics Comprehensive Chemistry Requirements
CHEM 160
                General Chemistry
                                                                 3
CHEM 160L
                General Chemistry Laboratory
                                                                 1
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CHEM 161	General Chemistry	3
CHEM 161L	General Chemistry Laboratory	1
Physics Emphasis	Requirements	
Select one of the f	following:	36-42
Comprehensive	e Physics Emphasis	
Engineering Em	nphasis	
Astrophysics E	mphasis	
Total Credit Hours	;	56-62

## **Comprehensive Physics Emphasis**

Code	Title	Credit Hours
Comprehensiv	e Physics Emphasis Requirements	
PHYS 123	Freshman Physics Seminar	3
PHYS 360	Computational Methods in Physics and Astronomy	3
PHYS 402	Analytic Mechanics	4
PHYS 407	Electricity & Magnetism	4
PHYS 419	Quantum Mechanics	4
PHYS 420	Advanced Physics Laboratory	3
PHYS 430	Optics	3
PHYS 435	Solid State Physics	3
PHYS 440	Thermodynamics and Statistical Mechanics	3
PHYS 495	Research in Physics	3
PHYS 498	Senior Seminar in Physics	3
Total Credit Ho	ours	36

## **Engineering Emphasis**

Title

**Engineering Emphasis Requirements** 

Code

		Credit
		Hours

Engineering Core R	lequirements	
ENGR 101	Introduction to Engineering	3
Physics Elective Re	equirements	
Select 9 credit hou	urs from the following courses:	9
PHYS 350	Astrophysics I	
PHYS 351	Astrophysics II	
PHYS 360	Computational Methods in Physics and Astronomy	
PHYS 361	Astronomy Methods II	
PHYS 402	Analytic Mechanics	
PHYS 407	Electricity & Magnetism	
PHYS 419	Quantum Mechanics	
PHYS 420	Advanced Physics Laboratory	
PHYS 430	Optics	
PHYS 435	Solid State Physics	
PHYS 440	Thermodynamics and Statistical Mechanics	
PHYS 495	Research in Physics	
Engineering Electiv	res	11
ENGR 130	Computer Aided Drafting for Mechanical Engineering	

ENGR 155	Engineering Problem Solving: MATLAB	
ENGR 200	Engineering Thermodynamics	
ENGR 215	Engineering Circuits I	
ENGR 216	Engineering Circuits II	
ENGR 223	Engineering Statics	
ENGR 325	Mechanics of Materials	
ENGR 373	Engineering Dynamics	
Students must at 300 level or Engineering an of these hours Senior Enginee	take 18 credit hours of engineering classes above from an ABET (Accreditation Board of d Technology) accredited university. Three must demonstrate experiential learning, e.g. ering Design.	18
Total Credit Ho	ours	41
Astronhysic	e Emphasis	
Code	Titlo	Cradit
Code	Title	Hours
Astrophysics E	mphasis Requirements	
PHYS 123	Freshman Physics Seminar	3
PHYS 210	Astronomy	3
PHYS 350	Astrophysics I	3
PHYS 351	Astrophysics II	3
PHYS 360	Computational Methods in Physics and Astronomy	3
PHYS 361	Astronomy Methods II	3
PHYS 402	Analytic Mechanics	4
PHYS 407	Electricity & Magnetism	4
PHYS 419	Quantum Mechanics	4
PHYS 430	Optics	3
PHYS 440	Thermodynamics and Statistical Mechanics	3
PHYS 495	Research in Physics	3
PHYS 498	Senior Seminar in Physics	3
Total Credit Ho	ours	42

1

Students without sufficient preparation will also need to take the following courses, increasing the total credit hours needed:

• MATH 102

• MATH 103

2

Designated courses with the appropriate content may be approved to satisfy one of the Broad Knowledge requirements plus LOPER 9 or Broad Knowledge plus LOPER 10. Courses may be approved to satisfy LOPER 9 or LOPER 10 alone. (Courses satisfying LOPER 9 or LOPER 10 alone must be 3 credit hours.) Students applying this option will need to take additional hours in other categories to meet the required General Education hours.

This document represents a sample 4-year plan for degree completion with this major. Actual course selection and sequence may vary and should be discussed individually with your academic advisor. Advisors can also help you plan other experiences to enrich your undergraduate education such as internships, education abroad, undergraduate research, learning communities, and service learning and communitybased learning.

Code	Title	Credit Hours	
Semester 1			
LOPER 1: First-yea	ar Seminar	3	
PHYS 123	Freshman Physics Seminar	3	
MATH 115	Calculus I with Analytic Geometry	5	
LOPER 2: Writing	Skills	3	
Total Credit Hours	3	14	
Code	Title	Credit Hours	
Semester 2			
PHYS 275	General Physics I (Calculus)	5	
& 275L	and General Physics I (Calculus) Laboratory		
MATH 202	Calculus II with Analytic Geometry	5	
LOPER 3: Oral Cor	mmunication Skills	3	
LOPER 5: Visual o	r Performing Arts	3	
Total Credit Hours	3	16	
Code	Title	Credit Hours	
Semester 3			
PHYS 276	General Physics II (Calculus)	5	
& 276L	and General Physics II (Calculus) Laboratory		
MATH 260	Calculus III	5	
CHEM 160	General Chemistry	4	
& 160L	and General Chemistry Laboratory		
Total Credit Hours	3	14	
Code	Title	Credit	
Somostor 4		Hours	
	Modorn Physics I	Λ	
	Mathematical Techniques in Physics I	4	
MATH 205	Differential Equations	3	
CHEM 161	General Chemistry	3	
& 161L	and General Chemistry Laboratory	-	
Total Credit Hours	3	14	
Code	Title	Credit Hours	
Semester 5			
PHYS 360	Computational Methods in Physics and Astronomy	3	
PHYS 407	Electricity & Magnetism	4	
PHYS 430	Optics	3	
LOPER 6: Humani	ties	3	
LOPER 7: Social S	cience	3	
Total Credit Hours	3	16	

Code	Title	Credit Hours
Semester 6		
PHYS 419	Quantum Mechanics	4
PHYS 420	Advanced Physics Laboratory	3
LOPER 9: Civic	c Competency and Engagement	3
LOPER 10: Res	spect for Human Diversity	3
Unrestricted E	lective	3
Total Credit Ho	ours	16
Code	Title	Credit Hours
Semester 7		
PHYS 402	Analytic Mechanics	4
PHYS 440	Thermodynamics and Statistical Mechanics	3
PHYS 495	Research in Physics	3
Unrestricted E	lective	3
Unrestricted E	lective	3
Total Credit Ho	ours	16
Code	Title	Credit Hours
Semester 8		
PHYS 435	Solid State Physics	3
PHYS 498	Senior Seminar in Physics	3
Unrestricted E	lective	3
Unrestricted E	lective	3
Unrestricted E	lective	3
Total Credit Ho	ours	15

**Total Credit Hours** 

**MATH 202** 

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Code	Title	Credit Hours
Semester 1		
LOPER 1: First-y	ear Seminar	3
PHYS 123	Freshman Physics Seminar	3
MATH 115	Calculus I with Analytic Geometry	5
LOPER 2: Writing	g Skills	3
LOPER 3: Oral Co	ommunication Skills	3
Total Credit Hou	rs	17
Code	Title	Credit Hours
Semester 2		
PHYS 275 & 275L	General Physics I (Calculus) and General Physics I (Calculus) Laboratory	5

Calculus II with Analytic Geometry

5

PHYS 210	Astronomy	3
LOPER 5: Visual of	or Performing Arts	3
Total Credit Hour	S	16
Code	Title	Credit Hours
Semester 3		
PHYS 276 & 276L	General Physics II (Calculus) and General Physics II (Calculus) Laboratory	5
MATH 260	Calculus III	5
CHEM 160	General Chemistry	4
& 160L	and General Chemistry Laboratory	
Total Credit Hour	S	14
Code	Title	Credit Hours
Semester 4	Madam Dharian I	
PHYS 346	Modern Physics I	4
PHYS 410	Mathematical Techniques in Physics I	3
MATH 305		3
CHEM 161 & 1611	General Chemistry	4
Total Credit Hour	s	14
Code	Title	Credit
Somester 5		Hours
PHYS 360	Computational Methods in Physics and	3
PHVS /07	Electricity & Magnetism	1
PHVS 430	Ontics	3
LOPER 6: Human	ities	3
LOPER 7: Social S	Science	3
Total Credit Hour	s	16
Code	Title	Credit
Company C		Hours
	Quantum Machanica	1
DUVS 261	Astronomy Mothodo II	4
	Astronomy methods in	3
LOPER 10: Bespe	or for Human Diversity	3
Unrestricted Flec	tive	3
Total Credit Hour	e	16
Total ofcult flour	5	10
Code	Title	Credit Hours
	Analytic Machanica	
	Thermodynamics and Statistical	4
PH15 440	Mechanics	3
PHYS 495	Research in Physics	3
PHYS 350	Astrophysics I	3

Unrestricted Elective Total Credit Hours		2
		15
Code	Title	Credit Hours
Semester 8		
PHVS 351	Astrophysics II	3

11110 001	/ otrophy or oo h	0
PHYS 498	Senior Seminar in Physics	3
Unrestricted Elect	ive	3
Unrestricted Elect	ive	3
Unrestricted Elect	ive	3
Total Credit Hours	3	15

This document represents a sample 4-year plan for degree completion with this major. Actual course selection and sequence may vary and should be discussed individually with your academic advisor. Advisors can also help you plan other experiences to enrich your undergraduate education such as internships, education abroad, undergraduate research, learning communities, and service learning and communitybased learning.

Code	Title	Credit Hours
Semester 1		
LOPER 1: First-y	vear Seminar	3
ENGR 101	Introduction to Engineering	3
MATH 115	Calculus I with Analytic Geometry	5
LOPER 2: Writin	g Skills	3
LOPER 3: Oral C	communication Skills	3
Total Credit Hou	Irs	17
Code	Title	Credit Hours
Semester 2		
PHYS 275 & 275L	General Physics I (Calculus) and General Physics I (Calculus) Laboratory	5
MATH 202	Calculus II with Analytic Geometry	5
LOPER 5: Visual or Performing Arts		3
LOPER 6: Huma	nities	3
Total Credit Hou	irs	16
Code	Title	Credit Hours
	Coporal Physics II (Coloulus)	5
& 276L	and General Physics II (Calculus) Laboratory	0
MATH 260	Calculus III	5
CHEM 160 & 160L	General Chemistry and General Chemistry Laboratory	4
ENGR Elective		3
Total Credit Hou	Irs	17

	litie	Credit Hours
Semester 4		
PHYS 346	Modern Physics I	4
PHYS 410	Mathematical Techniques in Physics I	3
MATH 305	Differential Equations	3
CHEM 161	General Chemistry	4
& 161L	and General Chemistry Laboratory	0
ENGR Elective		3
Total Credit Ho	urs	17
Code	Title	Credit Hours
Semester 5		
ENGR Elective		4
PHYS Elective		4
LOPER 7: Socia	al Science	3
LOPER 9: Civic	Competency and Engagement	3
Unrestricted El	ective	3
Total Credit Ho	urs	17
Code	Titlo	Credit
oode	me	Hours
Semester 6	inte	Hours
Semester 6 ENGR Elective	Inte	Hours 3
Semester 6 ENGR Elective PHYS Elective	Inte	Hours 3
Semester 6 ENGR Elective PHYS Elective PHYS Elective		Hours 3 3
Semester 6 ENGR Elective PHYS Elective PHYS Elective LOPER 10: Res	pect for Human Diversity	Hours 3 3 3 3
Semester 6 ENGR Elective PHYS Elective PHYS Elective LOPER 10: Res Unrestricted El	pect for Human Diversity ective	Hours 3 3 3 3 3 3
Semester 6 ENGR Elective PHYS Elective PHYS Elective LOPER 10: Res Unrestricted El Total Credit Ho	pect for Human Diversity ective urs	Hours 3 3 3 3 3 3 3 3 3
Semester 6 ENGR Elective PHYS Elective LOPER 10: Res Unrestricted El Total Credit Ho Code	pect for Human Diversity ective urs Title	Hours 3 3 3 3 3 3 15 Credit Hours
Semester 6 ENGR Elective PHYS Elective PHYS Elective LOPER 10: Res Unrestricted El Total Credit Ho Code Semester 7 Semester is en	pect for Human Diversity ective urs Title	Hours 3 3 3 3 3 15 Credit Hours
Semester 6 ENGR Elective PHYS Elective PHYS Elective LOPER 10: Res Unrestricted El Total Credit Ho Code Semester 7 Semester is sp this semester; s	pect for Human Diversity ective urs Title ent at UNL for completion of 3+2 degree. For see UNL for suggested class schedule.	Hours 3 3 3 3 3 15 Credit Hours
Semester 6 ENGR Elective PHYS Elective LOPER 10: Res Unrestricted El Total Credit Ho Code Semester 7 Semester is sp this semester, s Code Semester 8	pect for Human Diversity ective urs Title ent at UNL for completion of 3+2 degree. For see UNL for suggested class schedule. Title	Hours Hours 3 3 3 3 3 3 15 Credit Hours Credit Hours
Semester 6 ENGR Elective PHYS Elective PHYS Elective LOPER 10: Res Unrestricted El Total Credit Ho Code Semester 7 Semester is sp this semester, s Code Semester 8 Semester is sp	pect for Human Diversity ective urs Title ent at UNL for completion of 3+2 degree. For see UNL for suggested class schedule. Title ent at UNL for completion of 3+2 degree. For	Hours 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3

Students may take ACE (https://ace.unl.edu/courses/listing/) courses in place of LOPER courses to fulfill General Education requirements. See your advisor for more information.