# **BIOLOGY, B.S. (BERKS)**

Begin Campus: Any Penn State Campus

End Campus: Berks

## **Degree Requirements**

For the Bachelor of Science degree in Biology, a minimum of 124 credits is required:

Requirement	Credits
General Education	45
Requirements for the Major	94

15 of the 45 credits for General Education are included in the Requirements for the Major. This includes: 9 credits of GN courses; 6 credits of GQ courses.

### **Requirements for the Major**

To graduate, a student enrolled in the major must earn a grade of C or better in each course designated by the major as a C-required course, as specified by Senate Policy 82-44 (https://senate.psu.edu/policies-andrules-for-undergraduate-students/82-00-and-83-00-degree-requirements/ #82-44).

### **Common Requirements for the Major (All Options)**

Code	Title C	redits
Prescribed Cours	ses	
CHEM 111	Experimental Chemistry I	1
CHEM 113	Experimental Chemistry II	1
MATH 141	Calculus with Analytic Geometry II	4
Prescribed Course	es: Require a grade of C or better	
BIOL 110	Biology: Basic Concepts and Biodiversity	4
BIOL 220W	Biology: Populations and Communities	4
BIOL 230W	Biology: Molecules and Cells	4
BIOL 240W	Biology: Function and Development of Organisms	4
CHEM 110	Chemical Principles I	3
CHEM 112	Chemical Principles II	3
MATH 140	Calculus With Analytic Geometry I	4
Additional Cours	es	
Select one of the	following:	8-12
PHYS 211 & PHYS 212 & PHYS 213 & PHYS 214	General Physics: Mechanics and General Physics: Electricity and Magnetism and General Physics: Fluids and Thermal Physics and General Physics: Wave Motion and Quantum Physics	I
PHYS 250 & PHYS 251	Introductory Physics I and Introductory Physics II	
Select one of the	following:	3-4
STAT 200	Elementary Statistics	
STAT 240	Introduction to Biometry	
STAT 250	Introduction to Biostatistics	
Requirements fo	r the Option	
Select an option		46-51

### **Requirements for the Option**

Ecology Option (46-51 credits)

Available at the followil	ng campuses: Altoona,	, Schuyikili, University Park

Code	Title	Credits
Prescribed Cours	es	
BIOL 463	General Ecology	3
Additional Course	25	
STAT 462	Applied Regression Analysis	3
or STAT 464	Applied Nonparametric Statistics	
Select one of the	following:	6-8
CHEM 202 & CHEM 203	Fundamentals of Organic Chemistry I and Fundamentals of Organic Chemistry II	
CHEM 210 & CHEM 212 & CHEM 213	Organic Chemistry I and Organic Chemistry II and Laboratory in Organic Chemistry	
Grouns		

### Groups

Select a minimum of 15 credits of 400-level biology courses, with at least 6 credits from the Ecology group, 3 credits from the Evolution group, and 3 credits from the Practicum group. A maximum of 3 credits of BIOL 400, 494, 495, 496, and SC 295, 395, 495 may be used to fulfill 15 credits minimum in the 400-level biology course requirements.

### Ecology Group:

Symbiosis
Ecology of Infectious Diseases
Ecotoxicology
Invertebrate Zoology
Ecological and Environmental Problem Solving
Biology of Fungi
Animal Behavior
Ecology of Lakes and Streams
Population Ecology and Global Climate Change
Theoretical Population Ecology
Field Ecology
Physiological Ecology
Experimental Field Biology
Sociobiology
Astrobiology
Coastal Biology
Tropical Field Ecology
Molecular Evolution
Symbiosis
Medical Embryology
Taxonomy of Seed Plants
Invertebrate Zoology
Paleobotany
Comparative Anatomy of Vertebrates
Advanced Genetics
Biology of Fungi
Fuchation
Evolution Population Genetics

BIOL 429	Animal Behavior	CHEM 202	Fundamentals of Organic Chemistry I
BIOL 432	Developmental Genetics	& CHEM 203	and Fundamentals of Organic Chemistry II
BIOL 433	Evolution of Vertebrates	CHEM 210	Organic Chemistry I
BIOL 434	Pathobiology of Emerging Infectious Disease	& CHEM 212	and Organic Chemistry II
BIOL 436	Population Ecology and Global Climate Change	& CHEM 213	and Laboratory in Organic Chemistry
BIOL 438	Theoretical Population Ecology	Groups	
BIOL 439	Practical Bioinformatics		m of 18 credits of 400-level biology courses, with
BIOL 443	Evo-devo: Evolution of Developmental Mechanisms		from each of the following groups (each course satisfy a requirement in only one group). Moreover,
BIOL 446	Physiological Ecology		credits of BIOL 400, 494, 495, 496 and SC 295, 395,
BIOL 451	Biology of RNA		t to fulfill the 18 credit minimum in the 400-level
BIOL 460	Human Genetics	biology course re	equirements.
BIOL 463	General Ecology	Plant and Fungi	Group:
BIOL 464	Sociobiology	BIOL 406	Symbiosis
BIOL 474	Astrobiology	BIOL 407	Plant Developmental Anatomy
BIOL 478	COMPARATIVE NEUROANATOMY	BIOL 414	Taxonomy of Seed Plants
Practicum Grou		BIOL 420	Paleobotany
BIOL 400	Teaching in Biology	BIOL 424	Seeds of Change: The Uses of Plants
BIOL 400 BIOL 402W	Biological Experimental Design	<b>BIOL/PPEM</b>	Biology of Fungi
BIOL 402W		425	., .
	Plant Developmental Anatomy	BIOL 431	Reproductive Biology
BIOL 414	Taxonomy of Seed Plants	BIOL 441	Plant Physiology
BIOL 417	Invertebrate Zoology	BIOL 444	Field Ecology
BIOL 419	Ecological and Environmental Problem Solving	BIOL 446	Physiological Ecology
BIOL 421	Comparative Anatomy of Vertebrates	BIOL 448	Ecology of Plant Reproduction
BIOL 422	Advanced Genetics	BIOL 451	Biology of RNA
BIOL/PPEM	Biology of Fungi	BIOL 482	Coastal Biology
425		BIOL 499A	Tropical Field Ecology
BIOL 433	Evolution of Vertebrates	PPEM 427	Mycotoxins: Effects of Fungal Toxins on Human
BIOL 437	Histology		and Animal Health
BIOL 439	Practical Bioinformatics	Evolution Group:	
BIOL 444	Field Ecology	BIOL 405	Molecular Evolution
BIOL 450W	Experimental Field Biology	BIOL 400	Symbiosis
BIOL 461	Contemporary Issues in Science and Medicine	BIOL 411	Medical Embryology
BIOL 473	Laboratory in Mammalian Physiology		
BIOL 475N		BIOL 414	Taxonomy of Seed Plants
BIOL 478	COMPARATIVE NEUROANATOMY	BIOL 417	Invertebrate Zoology
BIOL 482	Coastal Biology	BIOL 420	Paleobotany
BIOL 494	Research Project	BIOL 421	Comparative Anatomy of Vertebrates
BIOL 495	Internship in Biology	BIOL 422	Advanced Genetics
BIOL 496	Independent Studies	BIOL/PPEM	Biology of Fungi
BIOL 499A	Tropical Field Ecology	425	
BIOTC 459	Plant Tissue Culture and Biotechnology	BIOL 427	Evolution
SC 295	Science Co-op Work Experience I	BIOL 428	Population Genetics
SC 395	Science Co-op Work Experience II	BIOL 429	Animal Behavior
SC 495	Science Co-op Work Experience III	BIOL 432	Developmental Genetics
	irses and Related Areas	BIOL 433	Evolution of Vertebrates
	edits from department list 17-24	BIOL 434	Pathobiology of Emerging Infectious Disease
		BIOL 436	Population Ecology and Global Climate Change
	Option (46-51 credits)	BIOL 438	Theoretical Population Ecology
	following campuses: Abington, Altoona, Beaver, Berks,	BIOL 439	Practical Bioinformatics
randywine, Har	risburg, Schuylkill, Scranton, University Park, York	BIOL 443	Evo-devo: Evolution of Developmental Mechanism
Code	Title Credits	BIOL 446	Physiological Ecology
-		BIOL 451	Biology of RNA
dditional Cour	Ses	5.02 .0.	57 -

BIOL 463	General Ecology	BIOL 415	Ecotoxicology	
BIOL 464	Sociobiology	BIOL 416	Biology of Cancer	
BIOL 474	Astrobiology	BIOL 421	Comparative Anatomy of Vertebrates	
BIOL 478	COMPARATIVE NEUROANATOMY	BIOL 424	Seeds of Change: The Uses of Plants	
Genetics and De	velopmental Biology Group:	BIOL 426	Developmental Neurobiology	
BIOL 404	Cellular Mechanisms in Vertebrate Physiology	BIOL 430	Developmental Biology	
BIOL 405	Molecular Evolution	BIOL 431	Reproductive Biology	
BIOL 407	Plant Developmental Anatomy	BIOL 432	Developmental Genetics	
BIOL 411	Medical Embryology	BIOL 437	Histology	
BIOL 413	Cell Signaling and Regulation	BIOL 443	Evo-devo: Evolution of Developmental Mechanis	sms
BIOL 416	Biology of Cancer	BIOL 446	Physiological Ecology	
BIOL 422	Advanced Genetics	BIOL 460	Human Genetics	
BIOL 426	Developmental Neurobiology	BIOL 469	Neurobiology	
BIOL 428	Population Genetics	BIOL 470	Functional and Integrative Neuroscience	
BIOL 430	Developmental Biology	BIOL 472	Human Physiology	
BIOL 431	Reproductive Biology	BIOL 478		
BIOL 432	Developmental Genetics	BIOL 479	General Endocrinology	
BIOL 432	Practical Bioinformatics	BIOL 482	Coastal Biology	
BIOL 443	Evo-devo: Evolution of Developmental Mechanisms	Practicum Group		
BIOL 448	Ecology of Plant Reproduction	BIOL 400	Teaching in Biology	
BIOL 451	Biology of RNA	BIOL 400	Biological Experimental Design	
BIOL 451 BIOL 460	Human Genetics	BIOL 402W		
			Plant Developmental Anatomy Taxonomy of Seed Plants	
BIOL 467	Molecular Basis of Neurological Diseases	BIOL 414		
BIOL 469	Neurobiology	BIOL 417	Invertebrate Zoology	
MICRB 410	Principles of Immunology	BIOL 419	Ecological and Environmental Problem Solving	
Ecology Group:	0 million in	BIOL 421	Comparative Anatomy of Vertebrates	
BIOL 406	Symbiosis	BIOL 422	Advanced Genetics	
BIOL 412	Ecology of Infectious Diseases	BIOL/PPEM 425	Biology of Fungi	
BIOL 415	Ecotoxicology	BIOL 433	Evolution of Vertebrates	
BIOL 417 BIOL 419	Invertebrate Zoology	BIOL 437	Histology	
	Ecological and Environmental Problem Solving	BIOL 439	Practical Bioinformatics	
BIOL/PPEM 425	Biology of Fungi	BIOL 444	Field Ecology	
BIOL 429	Animal Behavior	BIOL 450W	Experimental Field Biology	
BIOL 425	Ecology of Lakes and Streams	BIOL 461	Contemporary Issues in Science and Medicine	
BIOL 435	Population Ecology and Global Climate Change	BIOL 473	Laboratory in Mammalian Physiology	
BIOL 430 BIOL 438	Theoretical Population Ecology	BIOL 475N	Laboratory in Manimalian Physiology	
			Advanced Human Anotomy, codever based	
BIOL 444 BIOL 446	Field Ecology	BIOL 476	Advanced Human Anatomy - cadaver based	
	Physiological Ecology	BIOL 478		
BIOL 450W	Experimental Field Biology	BIOL 482	Coastal Biology	
BIOL 463	General Ecology	BIOL 494	Research Project	
BIOL 464	Sociobiology	BIOL 495	Internship in Biology	
BIOL 474	Astrobiology	BIOL 496	Independent Studies	
BIOL 482	Coastal Biology	BIOL 499A	Tropical Field Ecology	
BIOL 499A	Tropical Field Ecology	BIOTC 459	Plant Tissue Culture and Biotechnology	
Physiology Grou		SC 295	Science Co-op Work Experience I	
BIOL 404	Cellular Mechanisms in Vertebrate Physiology	SC 395	Science Co-op Work Experience II	
BIOL 406	Symbiosis	SC 495	Science Co-op Work Experience III	
BIOL 409	Biology of Aging		ses and Related Areas	
BIOL 411	Medical Embryology	Select 20-27 cred	lits from department list	20-2
BIOL 412	Ecology of Infectious Diseases			
BIOL 413	Cell Signaling and Regulation			

Genetics and Developmental Biology Option (46-51 credits) Available at the following campuses: Abington, Berks, Harrisburg, Schuylkill, University Park, York

Code	Title	Credits
Prescribed Cours	ses	
BIOL 322	Genetic Analysis	3
BIOL 430	Developmental Biology	3
BMB 401	General Biochemistry	3
BMB 402	General Biochemistry	3
CHEM 210	Organic Chemistry I	3
CHEM 212	Organic Chemistry II	3
CHEM 213	Laboratory in Organic Chemistry	2
Additional Cours	ses	
Select 2-5 credit	s from the following:	2-5
MATH 220	Matrices	
MATH 231	Calculus of Several Variables	
MICRB 201	Introductory Microbiology	
MICRB 202	Introductory Microbiology Laboratory	
Groups		

Groups

Select a minimum of 12 credits of 400-level courses, with at least 6 12 credits from the Genetics and Developmental Biology group, 3 credits from Evolution, and 3 credits from the Practicum group. A maximum of 3 credits of BIOL 400, 494, 495, 496 and SC 295, 395, 495 may be used to fulfill the 12 credit minimum in the 400-level biology course requirements.

Genetics and Developmental Biology Group:

BIOL 404	Cellular Mechanisms in Vertebrate Physiology
BIOL 405	Molecular Evolution
BIOL 407	Plant Developmental Anatomy
BIOL 411	Medical Embryology
BIOL 413	Cell Signaling and Regulation
BIOL 416	Biology of Cancer
BIOL 422	Advanced Genetics
BIOL 426	Developmental Neurobiology
BIOL 428	Population Genetics
BIOL 431	Reproductive Biology
BIOL 432	Developmental Genetics
BIOL 439	Practical Bioinformatics
BIOL 443	Evo-devo: Evolution of Developmental Mechanisms
BIOL 448	Ecology of Plant Reproduction
BIOL 451	Biology of RNA
BIOL 460	Human Genetics
BIOL 467	Molecular Basis of Neurological Diseases
BIOL 469	Neurobiology
BMB 400	Molecular Biology of the Gene
or BMB 450	Bacterial Genetics
or BMB 464	Molecular Medicine
or BMB 484	Functional Genomics
or HORT 407	Plant Breeding
or MICRB 41	Principles of Immunology
Evolution Group:	
BIOL 405	Molecular Evolution
BIOL 406	Symbiosis

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an Physiology
ANATOMY
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Science Co-op Work Experience III		BIOL 417	Invertebrate Zoology
		BIOL 420	Paleobotany
	9-17	BIOL 421	Comparative Anatomy of Vertebrates
		BIOL 422	Advanced Genetics
		BIOL/PPEM 425	Biology of Fungi
Title	Credits	BIOL 427	Evolution
25		BIOL 428	Population Genetics
Neurobiology	3	BIOL 429	Animal Behavior
General Biochemistry	3	BIOL 432	Developmental Genetics
General Biochemistry	3	BIOL 433	Evolution of Vertebrates
Organic Chemistry I	3	BIOL 434	Pathobiology of Emerging Infectious Disease
Organic Chemistry II	3	BIOL 436	Population Ecology and Global Climate Change
	2	BIOL 438	Theoretical Population Ecology
		BIOL 439	Practical Bioinformatics
om the following:	3	BIOL 443	Evo-devo: Evolution of Developmental Mechanisms
		BIOL 446	Physiological Ecology
		BIOL 451	Biology of RNA
COMPARATIVE NEUROANATOMY		BIOL 460	Human Genetics
		BIOL 463	General Ecology
of 12 credits of 400-level bioloay courses. w	ith 12		Sociobiology
		BIOL 474	Astrobiology
		BIOL 478	COMPARATIVE NEUROANATOMY
	-		
12 credit minimum in the 400-level biology co	urse		Teaching in Biology
			Biological Experimental Design
•			Plant Developmental Anatomy
	ју		Taxonomy of Seed Plants
			Invertebrate Zoology
-			Ecological and Environmental Problem Solving
			Comparative Anatomy of Vertebrates
			Advanced Genetics
			Biology of Fungi
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5			Evolution of Vertebrates
			Histology
			Practical Bioinformatics
			Field Ecology
57			Experimental Field Biology
			Contemporary Issues in Science and Medicine
•			Laboratory in Mammalian Physiology
	avior and		
			COMPARATIVE NEUROANATOMY
			Coastal Biology
			Research Project
			Internship in Biology
7Clinical Neuropsychology			Independent Studies
		BIOL 499A	Tropical Field Ecology
Molecular Evolution		BIOTC 459	Plant Tissue Culture and Biotechnology
Molecular Evolution Symbiosis Medical Embryology		BIOTC 459 SC 295 SC 395	Science Co-op Work Experience I Science Co-op Work Experience II
	es and Related Areas s from department list on (46-51 credits) howing campuses: University Park Title es Neurobiology General Biochemistry Organic Chemistry I Organic Chemistry II Laboratory in Organic Chemistry es om the following: Developmental Neurobiology Functional and Integrative Neuroscience COMPARATIVE NEUROANATOMY of 12 credits of 400-level biology courses, wi from the Neuroscience group, 3 credits from t and 3 credits from the Practicum Group. A ma b 400, 494, 495, 496 and SC 295, 395, 495 ma 12 credit minimum in the 400-level biology courses out: Cellular Mechanisms in Vertebrate Physiology Developmental Neurobiology Developmental Biology Histology Molecular Basis of Neurological Diseases Functional and Integrative Neuroscience GOMPARATIVE NEUROANATOMY General Endocrinology Biobehavioral Aspects of Stress Pharmacological Influences on Health Neuroanatomical Bases for Disorders of Beh Health Bases for	es and Related Areas s from department list 9-17 on (46-51 credits) lowing campuses: University Park Tite Credits s Title Credits 8 Neurobiology 3 General Biochemistry Park S General Biochemistry 0 General Biochemistry 1 General Biochemistry 1 Grganic Chemistry 1 Corganic Chemistry 1 Corganic Chemistry 1 Laboratory in Organic Chemistry 2 s orn the following: 3 Developmental Neurobiology 0 Functional and Integrative Neuroscience COMPARATIVE NEUROANATOMY Functional and Integrative Neuroscience COMPARATIVE NEUROANATOMY A form the Neuroscience group, 3 credits from the not 3 credits from the Practicum Group. A maximum of 12 credits of 400-level biology courses with from the Neuroscience group, 3 credits from the and 3 credits from the Practicum Group. A maximum of 400, 494, 495, 496 and SC 295, 395, 495 may be 12 credit minimum in the 400-level biology course functional and Regulation Seeds of Change: The Uses of Plants Developmental Neurobiology Developmental Neurobiology Developmental Neurobiology 1 Elisology Molecular Basis of Neurological Diseases Functional and Integrative Neuroscience Human Physiology Laboratory in Mammalian Physiology GOMPARATIVE NEUROANATOMY General Endocrinology Biobehavioral Aspects of Stress Pharmacological Influences on Health Neuroanatomical Bases for Disorders of Behavior and Health B Carping and Memory GPHysiological Psychology	es and Related AreasBIOL 420s from department list9-17BIOL 421blowing campuses: University ParkBIOL 422TitleCreditsBIOL 423esBIOL 423BIOL 423Neurobiology3BIOL 423General Biochemistry3BIOL 433Organic Chemistry I3BIOL 433Organic Chemistry II3BIOL 433Laboratory in Organic Chemistry3BIOL 433Developmental NeurobiologyBIOL 443BIOL 443Functional and Integrative NeuroscienceBIOL 460COMPARATIVE NEUROANATOMYBIOL 463Date of 12 credits of 400-level biology courses, with 12BIOL 460from the Neuroscience group, 3 credits from the not 12 credit sfrom the Practicum Group. A maximum DL 400, 494, 495, 496 and SC 295, 395, 495 may be 12 credit minimum in the 400-level biology courseBIOL 400Dup:BIOL 400BIOL 417Cellular Mechanisms in Vertebrate PhysiologyBIOL 417Developmental NeurobiologyBIOL 417Developmental NeurobiologyBIOL 417BIOL 417BIOL 433BIOL 422BIOL 433BIOL 422BIOL 422BIOL 423BIOL 433Developmental NeurobiologyBIOL 422BIOL 424BIOL 422BIOL 425BIOL 423BIOL 426BIOL 422BIOL 427BIOL 422BIOL 428BIOL 423BIOL 423BIOL 423Developmental NeurobiologyBIOL 433BIOL 423BIOL 433B

Supporting Co	urses and Related Areas	
Select 14-19 ci	redits from department list	14-19
•••	ption (46-51 credits) following campuses: University Park	
Code	Title	Credits
Prescribed Co	Irses	
BIOL 407	Plant Developmental Anatomy	3
BIOL 441	Plant Physiology	3
BMB 401	General Biochemistry	3
BMB 402	General Biochemistry	3
CHEM 210	Organic Chemistry I	3
CHEM 212	Organic Chemistry II	3
CHEM 213	Laboratory in Organic Chemistry	2
Additional Cou	rses	

#### Groups

Select a minimum of 12 credits of 400-level biology courses, with 12 at least 6 credits from the Plant and Fungi group, 3 credits from the Evolution group, and 3 credits from the Practicum group. A maximum of 3 credits of BIOL 400, 494, 495, 496 and SC 295, 395, 495 may be used to fulfill the 12 credit minimum in the 400-level biology course requirements.

Plant and Fungi Group:

r lant and r ungr Group.						
	BIOL 406	Symbiosis				
	BIOL 414	Taxonomy of Seed Plants				
	BIOL 420	Paleobotany				
	BIOL 424	Seeds of Change: The Uses of Plants				
	BIOL/PPEM 425	Biology of Fungi				
	BIOL 431	Reproductive Biology				
	BIOL 444	Field Ecology				
	BIOL 446	Physiological Ecology				
	BIOL 448	Ecology of Plant Reproduction				
	BIOL 451	Biology of RNA				
	BIOL 482	Coastal Biology				
	BIOL 499A	Tropical Field Ecology				
	Evolution Group:					
	BIOL 405	Molecular Evolution				
	BIOL 406	Symbiosis				
	BIOL 411	Medical Embryology				
	BIOL 414	Taxonomy of Seed Plants				
	BIOL 417	Invertebrate Zoology				
	BIOL 420	Paleobotany				
	BIOL 421	Comparative Anatomy of Vertebrates				
	BIOL 422	Advanced Genetics				
	BIOL/PPEM 425	Biology of Fungi				
	BIOL 427	Evolution				
	BIOL 428	Population Genetics				
	BIOL 429	Animal Behavior				
	BIOL 432	Developmental Genetics				
	BIOL 433	Evolution of Vertebrates				
	BIOL 434	Pathobiology of Emerging Infectious Disease				

BIOL 436	Population Ecology and Global Climate Change					
BIOL 438	Theoretical Population Ecology					
BIOL 439	Practical Bioinformatics					
BIOL 443	Evo-devo: Evolution of Developmental Mechanis	ms				
BIOL 446	Physiological Ecology					
BIOL 451	Biology of RNA					
BIOL 460	Human Genetics					
BIOL 463	General Ecology					
BIOL 464	Sociobiology					
BIOL 474	Astrobiology					
BIOL 478	COMPARATIVE NEUROANATOMY					
Practicum Group	:					
BIOL 400	Teaching in Biology					
BIOL 402W	Biological Experimental Design					
BIOL 407	Plant Developmental Anatomy					
BIOL 414	Taxonomy of Seed Plants					
BIOL 417	Invertebrate Zoology					
BIOL 419	Ecological and Environmental Problem Solving					
BIOL 421	Comparative Anatomy of Vertebrates					
BIOL 422	Advanced Genetics					
<b>BIOL/PPEM</b>	Biology of Fungi					
425						
BIOL 433	Evolution of Vertebrates					
BIOL 437	Histology					
BIOL 439	Practical Bioinformatics					
BIOL 444	Field Ecology					
BIOL 450W	Experimental Field Biology					
BIOL 461	Contemporary Issues in Science and Medicine					
BIOL 473	Laboratory in Mammalian Physiology					
BIOL 475N						
BIOL 478	COMPARATIVE NEUROANATOMY					
BIOL 482	Coastal Biology					
BIOL 494	Research Project					
BIOL 495	Internship in Biology					
BIOL 496	Independent Studies					
BIOL 499A	Tropical Field Ecology					
BIOTC 459	Plant Tissue Culture and Biotechnology					
SC 295	Science Co-op Work Experience I					
SC 395	Science Co-op Work Experience II					
SC 495	Science Co-op Work Experience III					
Supporting Cours	ses and Related Areas					
Select 14-19 credits from department list 14-19						

### Vertebrate Physiology Option (46-51 credits) Available at the following campuses: Abington, Altoona, Brandywine, Schuylkill, University Park

Code	Title	Credits						
Prescribed Courses								
BIOL 472	Human Physiology	3						
BIOL 473	Laboratory in Mammalian Physiology	2						
BMB 401	General Biochemistry	3						
BMB 402	General Biochemistry	3						
CHEM 210	Organic Chemistry I	3						

	Organia Chemietry II	2		Evolution	
CHEM 212 CHEM 213	Organic Chemistry II Laboratory in Organic Chemistry	3 2	BIOL 427 BIOL 428	Evolution Population Genetics	
Additional Cours		2	BIOL 428 BIOL 429	Animal Behavior	
	ses				
Groups			BIOL 432	Developmental Genetics	
	Im of 12 credits of 400-level courses, with at least 6 Physiology group, 3 credits from the Evolution group,	12	BIOL 433	Evolution of Vertebrates	
	om the Practicum group. A maximum of 3 credits of		BIOL 434	Pathobiology of Emerging Infectious Disease	
BIOL 400, 494, 495, 496 and SC 295, 395, 495 may be used to fulfill he 12 credit minimum in the 400-level biology course requirements.			BIOL 436	Population Ecology and Global Climate Change	9
			BIOL 438	Theoretical Population Ecology	
Physiology Grou	ldr:		BIOL 439	Practical Bioinformatics	
BIOL 404	Cellular Mechanisms in Vertebrate Physiology		BIOL 443	Evo-devo: Evolution of Developmental Mechan	ISMS
BIOL 406	Symbiosis		BIOL 446	Physiological Ecology	
BIOL 409	Biology of Aging		BIOL 451	Biology of RNA	
BIOL 411	Medical Embryology		BIOL 460	Human Genetics	
BIOL 412	Ecology of Infectious Diseases		BIOL 463	General Ecology	
BIOL 413	Cell Signaling and Regulation		BIOL 464	Sociobiology	
BIOL 415	Ecotoxicology		BIOL 474	Astrobiology	
BIOL 416	Biology of Cancer		BIOL 478	COMPARATIVE NEUROANATOMY	
BIOL 421	Comparative Anatomy of Vertebrates		Practicum Group:		
BIOL 424	Seeds of Change: The Uses of Plants		BIOL 400	Teaching in Biology	
BIOL 426	Developmental Neurobiology		BIOL 402W	Biological Experimental Design	
BIOL 430	Developmental Biology		BIOL 407	Plant Developmental Anatomy	
BIOL 430 BIOL 431	Reproductive Biology		BIOL 414	Taxonomy of Seed Plants	
BIOL 431 BIOL 432	Developmental Genetics		BIOL 417	Invertebrate Zoology	
BIOL 432 BIOL 437	Histology		BIOL 419	Ecological and Environmental Problem Solving	
BIOL 437 BIOL 443	57		BIOL 421	Comparative Anatomy of Vertebrates	
BIOL 443 BIOL 446	Evo-devo: Evolution of Developmental Mechanisms Physiological Ecology		BIOL 422	Advanced Genetics	
BIOL 440 BIOL 460	Human Genetics		<b>BIOL/PPEM</b>	Biology of Fungi	
			425		
BIOL 469	Neurobiology		BIOL 433	Evolution of Vertebrates	
BIOL 470	Functional and Integrative Neuroscience COMPARATIVE NEUROANATOMY		BIOL 437	Histology	
BIOL 478			BIOL 439	Practical Bioinformatics	
BIOL 479	General Endocrinology		BIOL 444	Field Ecology	
BIOL 482	Coastal Biology		BIOL 448	Ecology of Plant Reproduction	
ANSC 431	Physiology of Animal Reproduction		BIOL 450W	Experimental Field Biology	
	l66The Skull		BIOL 461	Contemporary Issues in Science and Medicine	
	34 Functional Genomics		BIOL 473	Laboratory in Mammalian Physiology	
	or ENT 402WBiology of Animal Parasites		BIOL 475N	, , , ,	
or MICRB 40 Microbial Physiology and Structure			BIOL 476	Advanced Human Anatomy - cadaver based	
	or MICRB 41 Principles of Immunology		BIOL 478	COMPARATIVE NEUROANATOMY	
or MICRB	or MICRB 41 Medical Microbiology			Coastal Biology	
or MICRB	43 Viral Pathogensis		BIOL 482 BIOL 494	Research Project	
or PSYCH	46Physiological Psychology		BIOL 495	Internship in Biology	
Evolution Group	):		BIOL 496	Independent Studies	
BIOL 405	Molecular Evolution		BIOL 499A	Tropical Field Ecology	
BIOL 406	Symbiosis		BIOTC 459	Plant Tissue Culture and Biotechnology	
BIOL 411	Medical Embryology		SC 295	Science Co-op Work Experience I	
BIOL 414	Taxonomy of Seed Plants		SC 295	Science Co-op Work Experience I	
BIOL 417	Invertebrate Zoology		SC 395 SC 495	Science Co-op Work Experience II Science Co-op Work Experience III	
BIOL 420	Paleobotany				
BIOL 421	Comparative Anatomy of Vertebrates			rses and Related Areas	15-2
BIOL 422	Advanced Genetics		Select 15-20 credits from department list		
<b>BIOL/PPEM</b>	Biology of Fungi				
425					

15-20

## **General Education**

Connecting career and curiosity, the General Education curriculum provides the opportunity for students to acquire transferable skills necessary to be successful in the future and to thrive while living in interconnected contexts. General Education aids students in developing intellectual curiosity, a strengthened ability to think, and a deeper sense of aesthetic appreciation. These are requirements for all baccalaureate students and are often partially incorporated into the requirements of a program. For additional information, see the General Education Requirements (https://bulletins.psu.edu/undergraduate/generaleducation/baccalaureate-degree-general-education-program/) section of the Bulletin and consult your academic adviser.

The keystone symbol appears next to the title of any course that is designated as a General Education course. Program requirements may also satisfy General Education requirements and vary for each program.

## Foundations (grade of C or better is required and Inter-Domain courses do not meet this requirement.)

- · Quantification (GQ): 6 credits
- · Writing and Speaking (GWS): 9 credits

## Breadth in the Knowledge Domains (Inter-Domain courses do not meet this requirement.)

- Arts (GA): 3 credits
- · Health and Wellness (GHW): 3 credits
- · Humanities (GH): 3 credits
- · Social and Behavioral Sciences (GS): 3 credits
- · Natural Sciences (GN): 3 credits

### **Integrative Studies**

· Inter-Domain Courses (Inter-Domain): 6 credits

### Exploration

- · GN, may be completed with Inter-Domain courses: 3 credits
- GA, GH, GN, GS, Inter-Domain courses. This may include 3 credits of World Language course work beyond the 12th credit level or the requirements for the student's degree program, whichever is higher: 6 credits

## **University Degree Requirements**

### **First Year Engagement**

All students enrolled in a college or the Division of Undergraduate Studies at University Park, and the World Campus are required to take 1 to 3 credits of the First-Year Seminar, as specified by their college First-Year Engagement Plan.

Other Penn State colleges and campuses may require the First-Year Seminar; colleges and campuses that do not require a First-Year Seminar provide students with a first-year engagement experience.

First-year baccalaureate students entering Penn State should consult their academic adviser for these requirements.

### **Cultures Requirement**

6 credits are required and may satisfy other requirements

- · United States Cultures: 3 credits
- · International Cultures: 3 credits

### Writing Across the Curriculum

3 credits required from the college of graduation and likely prescribed as part of major requirements.

### **Total Minimum Credits**

A minimum of 120 degree credits must be earned for a baccalaureate degree. The requirements for some programs may exceed 120 credits. Students should consult with their college or department adviser for information on specific credit requirements.

### **Quality of Work**

Candidates must complete the degree requirements for their major and earn at least a 2.00 grade-point average for all courses completed within their degree program.

### Limitations on Source and Time for Credit Acquisition

The college dean or campus chancellor and program faculty may require up to 24 credits of course work in the major to be taken at the location or in the college or program where the degree is earned. Credit used toward degree programs may need to be earned from a particular source or within time constraints (see Senate Policy 83-80 (https://senate.psu.edu/ policies-and-rules-for-undergraduate-students/82-00-and-83-00-degreerequirements/#83-80)). For more information, check the Suggested Academic Plan for your intended program.