# MATHEMATICS, B.S. (SCIENCE)

Begin Campus: Any Penn State Campus

End Campus: University Park

### **Degree Requirements**

For the Bachelor of Science degree in Mathematics, a minimum of 120 credits is required:

Requirement	Credits
General Education	45
Electives	0-1
Requirements for the Major	80-84

6 of the 45 credits for General Education are included in the Requirements for the Major. This includes 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/students/ policies-and-rules-for-undergraduate-students/82-00-and-83-00-degreerequirements/).

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

Code	Title	Credits
Prescribed Cours	es	
Prescribed Course	s: Require a grade of C or better	
MATH 140	Calculus With Analytic Geometry I	4
MATH 141	Calculus with Analytic Geometry II	4
MATH 220	Matrices	2-3
MATH 230	Calculus and Vector Analysis	4
MATH 311W	Concepts of Discrete Mathematics	3-4
MATH 312	Concepts of Real Analysis	3
STAT 200	Elementary Statistics	4
Additional Course	es	
Additional Course	s: Require a grade of C or better	
MATH 250	Ordinary Differential Equations	3-4
or MATH 251	Ordinary and Partial Differential Equations	
Select 3 credits f	rom the following:	3
CMPSC 101	Introduction to Programming	
CMPSC 121	Introduction to Programming Techniques	
CMPSC 131	Programming and Computation I: Fundamenta	ls
CMPSC 200	Programming for Engineers with MATLAB	
CMPSC 201	Programming for Engineers with C++	
Requirements for	r the Option	
Select an option		50-51
Requirements for the Option Actuarial Mathematics Option (50-51 credits)		
Code	Title	Credits
Prescribed Cours	es	
Prescribed Course	es: Require a grade of C or better	

MATH 414	Introduction to Probability Theory	3
MATH 415	Introduction to Mathematical Statistics	3
MATH 416	Stochastic Modeling	3
MATH 484	Linear Programs and Related Problems	3
RM 302	Risk and Insurance	3
RM 410	Financial Mathematics for Actuaries	3
RM 411	Long Term Actuarial Mathematics - Fundamenta	ls 3
RM 421	Short Term Actuarial Mathematics - Fundamenta	als 3
Additional Cours	es	
Additional Course	s: Require a grade of C or better	
MATH 451	Numerical Computations	3
or MATH 486	Mathematical Theory of Games	
Select 9 credits f	rom the following:	9
IE 425	Stochastic Models in Operations Research	
or IE 468	Optimization Modeling and Methods	
RM 412	Long Term Actuarial Mathematics - Advanced Topics	
RM 422	Short Term Actuarial Mathematics - Advanced Topics	
STAT 380	Data Science Through Statistical Reasoning and Computation	
STAT 462	Applied Regression Analysis	
STAT 463	Applied Time Series Analysis	
Supporting Cours	ses and Related Areas	
Select 14-15 cred	lits from department list	14-15
Annlied and Indus	strial Mathematics (Intion (50-51 credits)	
Applied and Indus	Title	Credits
Applied and Indus Code Prescribed Cours	strial Mathematics Uption (50-51 credits) Title ses	Credits
Applied and Indus Code Prescribed Course Prescribed Course	strial Mathematics Uption (50-51 credits) Title ( ses es: Require a grade of C or better	Credits
Applied and Indus Code Prescribed Course Prescribed Course MATH 403	strial Mathematics Uption (50-51 credits) Title ( ses es: Require a grade of C or better Classical Analysis I	Credits
Applied and Indus Code Prescribed Course MATH 403 MATH 412	Strial Mathematics Uption (50-51 credits) Title Ses Eas: Require a grade of C or better Classical Analysis I Fourier Series and Partial Differential Equations	Credits 3 3
Applied and Indus Code Prescribed Course MATH 403 MATH 412 MATH 414	Strial Mathematics Uption (50-51 credits) Title ( Sees Ees: Require a grade of C or better Classical Analysis I Fourier Series and Partial Differential Equations Introduction to Probability Theory	Credits 3 3 3
Applied and Indus Code Prescribed Course MATH 403 MATH 412 MATH 414 MATH 415	Strial Mathematics Uption (50-51 credits)   Title   Ses   es: Require a grade of C or better   Classical Analysis I   Fourier Series and Partial Differential Equations   Introduction to Probability Theory   Introduction to Mathematical Statistics	Credits 3 3 3 3
Applied and Indus Code Prescribed Course MATH 403 MATH 412 MATH 414 MATH 415 MATH 436	Service A grade of C or better   Classical Analysis I   Fourier Series and Partial Differential Equations   Introduction to Probability Theory   Introduction to Mathematical Statistics   Linear Algebra	Credits 3 3 3 3 3 3 3
Applied and Indus Code Prescribed Course MATH 403 MATH 412 MATH 414 MATH 415 MATH 436 MATH 450	Strial Mathematics Option (50-51 credits)   Title Credits   Sees Classical Analysis I   Fourier Series and Partial Differential Equations Introduction to Probability Theory   Introduction to Mathematical Statistics Linear Algebra   Mathematical Modeling Mathematical Modeling	Credits 3 3 3 3 3 3 3 3 3 3 3
Applied and Indus Code Prescribed Course MATH 403 MATH 412 MATH 414 MATH 415 MATH 436 MATH 450 MATH 455	Title (a)   Title (a)   Ses (a)   Ess: Require a grade of C or better (a)   Classical Analysis I (a)   Fourier Series and Partial Differential Equations (a)   Introduction to Probability Theory (a)   Introduction to Mathematical Statistics (a)   Linear Algebra (a)   Mathematical Modeling (a)   Introduction to Numerical Analysis I (a)	2redits 3 3 3 3 3 3 3 3 3 3 3
Applied and Indus Code Prescribed Course MATH 403 MATH 412 MATH 414 MATH 415 MATH 436 MATH 436 MATH 450 MATH 455 Additional Course	Sets   Title   Sees   classical Analysis I   Fourier Series and Partial Differential Equations   Introduction to Probability Theory   Introduction to Mathematical Statistics   Linear Algebra   Mathematical Modeling   Introduction to Numerical Analysis I	2redits 3 3 3 3 3 3 3 3 3 3 3
Applied and Indus Code Prescribed Course MATH 403 MATH 412 MATH 414 MATH 415 MATH 415 MATH 436 MATH 450 MATH 455 Additional Course Additional Course	Strial Mathematics Uption (50-51 credits)   Title Credits   Ses Classical Analysis I   Fourier Series and Partial Differential Equations Introduction to Probability Theory   Introduction to Probability Theory Introduction to Mathematical Statistics   Linear Algebra Mathematical Modeling   Introduction to Numerical Analysis I es   es: Require a grade of C or better Statistics	Credits 3 3 3 3 3 3 3 3 3 3 3
Applied and Indus Code Prescribed Course MATH 403 MATH 412 MATH 414 MATH 415 MATH 436 MATH 450 MATH 455 Additional Course Select 12 credits	Strial Mathematics Option (50-51 credits)   Title Credits   Ses Ess: Require a grade of C or better   Classical Analysis I Fourier Series and Partial Differential Equations   Introduction to Probability Theory Introduction to Mathematical Statistics   Linear Algebra Mathematical Modeling   Introduction to Numerical Analysis I Ess: Require a grade of C or better   from the following: Estimate of C or better	Credits 3 3 3 3 3 3 3 3 2 3 2 2 2
Applied and Indus Code Prescribed Course MATH 403 MATH 412 MATH 414 MATH 415 MATH 436 MATH 455 Additional Course Select 12 credits MATH 411	Sets Frequire a grade of C or better   Classical Analysis I Fourier Series and Partial Differential Equations   Introduction to Probability Theory Introduction to Mathematical Statistics   Linear Algebra Mathematical Modeling   Introduction to Numerical Analysis I Sets   Sets Sets   Ordinary Differential Equations Setter	Credits 3 3 3 3 3 3 3 3 2 3 12
Applied and Indus Code Prescribed Course MATH 403 MATH 412 MATH 414 MATH 415 MATH 436 MATH 436 MATH 455 Additional Course Select 12 credits MATH 411 MATH 416	Title (1)   ses (2)   es: Require a grade of C or better (2)   Classical Analysis I (2)   Fourier Series and Partial Differential Equations (2)   Introduction to Probability Theory (2)   Introduction to Mathematical Statistics (2)   Linear Algebra (2)   Mathematical Modeling (2)   Introduction to Numerical Analysis I (2)   es (2)   is: Require a grade of C or better (2)   from the following: (2)   Ordinary Differential Equations (2)   Stochastic Modeling (2)	Credits 3 3 3 3 3 3 3 12
Applied and Indus Code Prescribed Course MATH 403 MATH 412 MATH 414 MATH 415 MATH 415 MATH 436 MATH 450 MATH 455 Additional Course Select 12 credits MATH 411 MATH 416 MATH 417	Strial Mathematics Option (50-51 credits)   Title Credits   Title Ges   ess: Require a grade of C or better Classical Analysis I   Fourier Series and Partial Differential Equations Introduction to Probability Theory   Introduction to Probability Theory Introduction to Mathematical Statistics   Linear Algebra Mathematical Modeling   Introduction to Numerical Analysis I es   es: Require a grade of C or better from the following:   Ordinary Differential Equations Stochastic Modeling   Qualitative Theory of Differential Equations Stochastic Modeling	Credits 3 3 3 3 3 3 3 2 3 2 2 2
Applied and Indus Code Prescribed Course MATH 403 MATH 412 MATH 414 MATH 415 MATH 415 MATH 455 Additional Course Select 12 credits MATH 411 MATH 411 MATH 411 MATH 417 MATH 419	Strial Mathematics Option (50-51 credits)   Title Credits   Title Ges   es: Require a grade of C or better Classical Analysis I   Fourier Series and Partial Differential Equations Introduction to Probability Theory   Introduction to Probability Theory Introduction to Mathematical Statistics   Linear Algebra Mathematical Modeling   Introduction to Numerical Analysis I es   es: Require a grade of C or better   from the following: Ordinary Differential Equations   Stochastic Modeling Qualitative Theory of Differential Equations   Theoretical Mechanics Theoretical Mechanics	Credits 3 3 3 3 3 3 3 3 3 12
Applied and Indus Code Prescribed Course MATH 403 MATH 403 MATH 412 MATH 414 MATH 415 MATH 436 MATH 455 Additional Course Select 12 credits MATH 411 MATH 411 MATH 411 MATH 419 MATH 421	strial Mathematics Option (50-51 credits)   Title   Title   ses   es: Require a grade of C or better   Classical Analysis I   Fourier Series and Partial Differential Equations   Introduction to Probability Theory   Introduction to Mathematical Statistics   Linear Algebra   Mathematical Modeling   Introduction to Numerical Analysis I   es   s: Require a grade of C or better   from the following:   Ordinary Differential Equations   Stochastic Modeling   Qualitative Theory of Differential Equations   Theoretical Mechanics   Complex Analysis	Credits 3 3 3 3 3 3 3 3 12
Applied and Indus Code Prescribed Course MATH 403 MATH 403 MATH 412 MATH 414 MATH 415 MATH 436 MATH 455 Additional Course Select 12 credits MATH 411 MATH 411 MATH 411 MATH 412 MATH 419 MATH 421 MATH 456	Title (1)   Title (2)   Ses (2)   es: Require a grade of C or better (2)   Classical Analysis I (2)   Fourier Series and Partial Differential Equations (2)   Introduction to Probability Theory (2)   Introduction to Mathematical Statistics (2)   Linear Algebra (2)   Mathematical Modeling (2)   Introduction to Numerical Analysis I (2)   es (2)   is: Require a grade of C or better (2)   from the following: (2)   Ordinary Differential Equations (2)   Stochastic Modeling (2)   Qualitative Theory of Differential Equations (2)   Theoretical Mechanics (2)   Complex Analysis (2)   Introduction to Numerical Analysis II (2)	Credits 3 3 3 3 3 3 3 12
Applied and Indus Code Prescribed Course MATH 403 MATH 403 MATH 412 MATH 414 MATH 415 MATH 455 Additional Course Select 12 credits MATH 411 Select 12 credits MATH 411 MATH 416 MATH 417 MATH 419 MATH 421 MATH 421 MATH 456 MATH 467	strial Mathematics Uption (5U-51 credits)   Title   Title   ses   es: Require a grade of C or better   Classical Analysis I   Fourier Series and Partial Differential Equations   Introduction to Probability Theory   Introduction to Mathematical Statistics   Linear Algebra   Mathematical Modeling   Introduction to Numerical Analysis I   es   s: Require a grade of C or better   from the following:   Ordinary Differential Equations   Stochastic Modeling   Qualitative Theory of Differential Equations   Theoretical Mechanics   Complex Analysis   Introduction to Numerical Analysis II   Factorization and Primality Testing	Credits 3 3 3 3 3 3 3 3 12
Applied and Indus Code Prescribed Course MATH 403 MATH 412 MATH 414 MATH 415 MATH 415 MATH 455 Additional Course Select 12 credits MATH 411 MATH 411 MATH 411 MATH 411 MATH 419 MATH 421 MATH 421 MATH 456 MATH 467	strial Mathematics Uption (5U-51 credits)   Title   Title   ses   es: Require a grade of C or better   Classical Analysis I   Fourier Series and Partial Differential Equations   Introduction to Probability Theory   Introduction to Mathematical Statistics   Linear Algebra   Mathematical Modeling   Introduction to Numerical Analysis I   es   s: Require a grade of C or better   from the following:   Ordinary Differential Equations   Stochastic Modeling   Qualitative Theory of Differential Equations   Theoretical Mechanics   Complex Analysis   Introduction to Numerical Analysis II   Factorization and Primality Testing   Mathematical Coding Theory	Credits 3 3 3 3 3 3 3 3 3 12
Applied and Indus Code Prescribed Course MATH 403 MATH 403 MATH 412 MATH 414 MATH 415 MATH 436 MATH 455 Additional Course Select 12 credits MATH 411 MATH 416 MATH 417 MATH 419 MATH 421 MATH 421 MATH 456 MATH 467 MATH 468 MATH 479	serial Mathematics Option (50-51 credits)   Title   Title   ses   es: Require a grade of C or better   Classical Analysis I   Fourier Series and Partial Differential Equations   Introduction to Probability Theory   Introduction to Mathematical Statistics   Linear Algebra   Mathematical Modeling   Introduction to Numerical Analysis I   es   s: Require a grade of C or better   from the following:   Ordinary Differential Equations   Stochastic Modeling   Qualitative Theory of Differential Equations   Theoretical Mechanics   Complex Analysis   Introduction to Numerical Analysis II   Factorization and Primality Testing   Mathematical Coding Theory   Special and General Relativity	Credits 3 3 3 3 3 3 3 3 12
Applied and Indus Code Prescribed Course MATH 403 MATH 412 MATH 412 MATH 414 MATH 415 MATH 436 MATH 455 Additional Course Select 12 credits MATH 411 MATH 416 MATH 417 MATH 419 MATH 421 MATH 421 MATH 421 MATH 456 MATH 467 MATH 468 MATH 479 MATH 484	Strial Mathematics Option (50-51 credits)TitleTitleSeses: Require a grade of C or betterClassical Analysis IFourier Series and Partial Differential EquationsIntroduction to Probability TheoryIntroduction to Mathematical StatisticsLinear AlgebraMathematical ModelingIntroduction to Numerical Analysis IesesOrdinary Differential EquationsStochastic ModelingQualitative Theory of Differential EquationsTheoretical MechanicsComplex AnalysisIntroduction to Numerical Analysis IIFactorization and Primality TestingMathematical Coding TheorySpecial and General RelativityLinear Programs and Related Problems	Credits 3 3 3 3 3 3 3 3 12
Applied and Indus     Code     Prescribed Course     MATH 403     MATH 412     MATH 414     MATH 415     MATH 455     Additional Course     Select 12 credits     MATH 416     MATH 411     MATH 416     MATH 416     MATH 417     MATH 418     MATH 419     MATH 419     MATH 421     MATH 456     MATH 468     MATH 479     MATH 484	Strial Mathematics Option (50-51 credits)TitleTitleSeses: Require a grade of C or betterClassical Analysis IFourier Series and Partial Differential EquationsIntroduction to Probability TheoryIntroduction to Mathematical StatisticsLinear AlgebraMathematical ModelingIntroduction to Numerical Analysis Iess: Require a grade of C or betterfrom the following:Ordinary Differential EquationsStochastic ModelingQualitative Theory of Differential EquationsTheoretical MechanicsComplex AnalysisIntroduction to Numerical Analysis IIFactorization and Primality TestingMathematical Coding TheorySpecial and General RelativityLinear Programs and Related ProblemsGraph Theory	Credits 3 3 3 3 3 3 3 3 12
Applied and Indus     Code     Prescribed Course     MATH 403     MATH 412     MATH 414     MATH 415     MATH 415     MATH 455     Additional Course     Select 12 credits     MATH 416     MATH 417     MATH 418     MATH 455     Additional Course     Select 12 credits     MATH 416     MATH 417     MATH 418     MATH 419     MATH 421     MATH 425     MATH 426     MATH 427     MATH 428     MATH 428     MATH 428     MATH 428     MATH 428	Strial Mathematics Option (50-51 credits)TitleTitleSesBes: Require a grade of C or betterClassical Analysis IFourier Series and Partial Differential EquationsIntroduction to Probability TheoryIntroduction to Mathematical StatisticsLinear AlgebraMathematical ModelingIntroduction to Numerical Analysis Iess: Require a grade of C or betterfrom the following:Ordinary Differential EquationsStochastic ModelingQualitative Theory of Differential EquationsTheoretical MechanicsComplex AnalysisIntroduction to Numerical Analysis IIFactorization and Primality TestingMathematical Coding TheorySpecial and General RelativityLinear Programs and Related ProblemsGraph TheoryMathematical Theory of Games	Credits 3 3 3 3 3 3 3 3 3 12

Supporting Cours	es and Related Areas	
Select 17-18 credi	its from department list	17-18
Computational Ma Code	thematics Option (50-51 credits) Title	Credits
Prescribed Course	25	
Prescribed Courses	s: Require a grade of C or better	
CMPSC 465	Data Structures and Algorithms	3
MATH 414	Introduction to Probability Theory	3
MATH 415	Introduction to Mathematical Statistics	3
MATH 455	Introduction to Numerical Analysis I	3
MATH 456	Introduction to Numerical Analysis II	3
Additional Course	S	
Additional Courses	: Require a grade of C or better	
CMPSC 122	Intermediate Programming	3
or CMPSC 132	Programming and Computation II: Data Structu	res
MATH 467	Factorization and Primality Testing	3
or MATH 465	Number Theory	
Select 3 credits fr	om the following:	3
MATH 411	Ordinary Differential Equations	
MATH 412	Fourier Series and Partial Differential Equations	3
MATH 417	Qualitative Theory of Differential Equations	
Select 9 credits fr	om the following:	9
CMPSC 442	Artificial Intelligence	2
MATH 310	Flementary Combinatorics	
MATH 452	Deen Learning Algorithms and Analysis	
MATH 457	Introduction to Mathematical Logic	
MATH 468	Mathematical Coding Theory	
MATH 480	Linear Programs and Belated Problems	
MATH 485	Granh Theory	
Supporting Cours	es and Belated Areas	
Select 17-18 credi	its from department list	17-18
Select 17-10 clear	its nom department list	17-10
General Mathemat	ics Option (50-51 credits)	
Code	Title	Credits
Prescribed Course	25	
Prescribed Courses	s: Require a grade of C or better	
MATH 403	Classical Analysis I	3
MATH 414	Introduction to Probability Theory	3
MATH 415	Introduction to Mathematical Statistics	3
Additional Course	S	
Additional Courses	: Require a grade of C or better	
MATH 435	Basic Abstract Algebra	3
or MATH 436	Linear Algebra	
Select 3 credits fr	om the following:	3
MATH 411	Ordinary Differential Equations	
MATH 412	Fourier Series and Partial Differential Equations	3
MATH 417	Qualitative Theory of Differential Equations	
MATH 419	Theoretical Mechanics	
MATH 421	Complex Analysis	
Select 6 credits of	f 400-level MATH courses except MATH 401	6

MATH 405, MATH 406, MATH 410, MATH 418, MATH 441, MATH 470, MATH 471. No more than 2 credits of MATH 400 may be used.

Select an approv or an area of app	red sequence of 12 credits in MATH or a related a plication	rea 12
Supporting Cour	dite from deportment list	1710
Select 17-18 cre	ans nom department list	17-18
Graduate Study ( Code	)ption (50-51 credits) Title	Credits
Prescribed Cours	ses	
Prescribed Cours	es: Require a grade of C or better	
MATH 403	Classical Analysis I	3
MATH 404	Classical Analysis II	3
MATH 414	Introduction to Probability Theory	3
MATH 415	Introduction to Mathematical Statistics	3
MATH 421	Complex Analysis	3
MATH 429	Introduction to Topology	3
MATH 435	Basic Abstract Algebra	3
MATH 436	Linear Algebra	3
Additional Cours	ses	
Additional Course	es: Require a grade of C or better	
Select 9 credits	of 400-level MATH courses except MATH 401,	9
MATH 405, MAT	H 406, MATH 418, MATH 441, MATH 470, MATH 4	471.
No more than 2	credits of MATH 400 may be used.	
Supporting Cour	ses and Related Areas	
Select 17-18 cre	dits from department list	17-18
Systems Analysis	s Ontion (50-51 credits)	
Code	Title	Credits
Prescribed Cours	ses	
Prescribed Cours	es: Require a grade of C or better	
MATH 414	Introduction to Probability Theory	3
MATH 415	Introduction to Mathematical Statistics	3
MATH 436	Linear Algebra	3
MATH 484	Linear Programs and Related Problems	3
Additional Cours	Ses .	
Additional Course		
	es: Require a grade of C or better	
Select 9 credits	es: Require a grade of C or better from the following:	9
Select 9 credits	es: Require a grade of C or better from the following: Elementary Combinatorics	9
Select 9 credits MATH 310 MATH 412	es: Require a grade of C or better from the following: Elementary Combinatorics Fourier Series and Partial Differential Equations	9
Select 9 credits MATH 310 MATH 412 MATH 448	es: Require a grade of C or better from the following: Elementary Combinatorics Fourier Series and Partial Differential Equations Mathematics of Finance	9
Select 9 credits MATH 310 MATH 412 MATH 448 MATH 451	es: Require a grade of C or better from the following: Elementary Combinatorics Fourier Series and Partial Differential Equations Mathematics of Finance Numerical Computations	9
Select 9 credits MATH 310 MATH 412 MATH 448 MATH 451 or MATH 4	es: Require a grade of C or better from the following: Elementary Combinatorics Fourier Series and Partial Differential Equations Mathematics of Finance Numerical Computations 55Introduction to Numerical Analysis I	9
Select 9 credits MATH 310 MATH 412 MATH 448 MATH 451 or MATH 4 MATH 485	es: Require a grade of C or better from the following: Elementary Combinatorics Fourier Series and Partial Differential Equations Mathematics of Finance Numerical Computations 55Introduction to Numerical Analysis I Graph Theory	9
Select 9 credits MATH 310 MATH 412 MATH 448 MATH 451 or MATH 4 MATH 485 MATH 486	es: Require a grade of C or better from the following: Elementary Combinatorics Fourier Series and Partial Differential Equations Mathematics of Finance Numerical Computations 55Introduction to Numerical Analysis I Graph Theory Mathematical Theory of Games	9
Select 9 credits MATH 310 MATH 412 MATH 448 MATH 451 or MATH 4 MATH 485 MATH 486 Select an approv	es: Require a grade of C or better from the following: Elementary Combinatorics Fourier Series and Partial Differential Equations Mathematics of Finance Numerical Computations 55Introduction to Numerical Analysis I Graph Theory Mathematical Theory of Games red sequence of 12 credits in an area of application	9 ; n: 12
Select 9 credits MATH 310 MATH 412 MATH 448 MATH 451 or MATH 45 MATH 485 MATH 485 Select an approv possible areas ir social sciences	es: Require a grade of C or better from the following: Elementary Combinatorics Fourier Series and Partial Differential Equations Mathematics of Finance Numerical Computations 55Introduction to Numerical Analysis I Graph Theory Mathematical Theory of Games red sequence of 12 credits in an area of application include business, economics, industrial engineerin	9 ; in; 12 g,
Select 9 credits MATH 310 MATH 412 MATH 448 MATH 451 or MATH 45 MATH 485 MATH 486 Select an approv possible areas ir social sciences Supporting Cour	es: Require a grade of C or better from the following: Elementary Combinatorics Fourier Series and Partial Differential Equations Mathematics of Finance Numerical Computations 55Introduction to Numerical Analysis I Graph Theory Mathematical Theory of Games red sequence of 12 credits in an area of application nclude business, economics, industrial engineerin ses and Related Areas	9 ; n; 12 g,

#### **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/ students/policies-and-rules-for-undergraduate-students/82-00-and-83-00degree-requirements/)). For more information, check the Suggested Academic Plan for your intended program.