

# MATHEMATICS, B.S. (BEHREND)

Seven Penn State campuses are scheduled for closure after Spring 2027: DuBois, Fayette, New Kensington, Mont Alto, Shenango, Wilkes-Barre, and York. New students are not being admitted at these campuses.

**Begin Campus:** Any Penn State Campus

**End Campus:** Erie

## Degree Requirements

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

| Requirement                | Credits |
|----------------------------|---------|
| General Education          | 45      |
| Electives                  | 7-8     |
| Requirements for the Major | 85-92   |

**18-24 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; 0-6 credits of GS courses; 3 credits of GWS courses.**

Per Senate Policy 83.80.5, the college dean or campus chancellor and program faculty may require up to 24 credits of coursework in the major to be taken at the location or in the college or program where the degree is earned.

## Requirements for the Major

A student enrolled in this major must earn at least a grade of C in each 300- and 400-level course in 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-degree-requirements/>).

## Common Requirements for the Major (All Options)

| Code                                                      | Title                                       | Credits |
|-----------------------------------------------------------|---------------------------------------------|---------|
| <b>Prescribed Courses</b>                                 |                                             |         |
| ENGL 202C                                                 | Effective Writing: Technical Writing        | 3       |
| <i>Prescribed Courses: Require a grade of C or better</i> |                                             |         |
| CMPSC 121                                                 | Introduction to Programming Techniques      | 3       |
| CMPSC 122                                                 | Intermediate Programming                    | 3       |
| MATH 140                                                  | Calculus With Analytic Geometry I           | 4       |
| MATH 141                                                  | Calculus with Analytic Geometry II          | 4       |
| MATH 220                                                  | Matrices                                    | 2       |
| MATH 230                                                  | Calculus and Vector Analysis                | 4       |
| MATH 251                                                  | Ordinary and Partial Differential Equations | 4       |
| MATH 311W                                                 | Concepts of Discrete Mathematics            | 4       |
| MATH 312                                                  | Concepts of Real Analysis                   | 3       |
| STAT 301                                                  |                                             | 3       |
| STAT 401                                                  | Experimental Methods                        | 3       |

## Additional Courses

Select 1 credit of GN designated course and 8 additional credits in one of the following sequences: 9

BIOL 110 & BIOL 220W Biology: Basic Concepts and Biodiversity and Biology: Populations and Communities

CHEM 110 & CHEM 111 & CHEM 112 & CHEM 113 Chemical Principles I and Experimental Chemistry I and Chemical Principles II and Experimental Chemistry II

PHYS 211 & PHYS 212 General Physics: Mechanics and General Physics: Electricity and Magnetism

PHYS 250 & PHYS 251 Introductory Physics I and Introductory Physics II

## Requirements for the Option

*Requirements for the Option: Require a grade of C or better*

Select an option 36-43

## Requirements for the Option

### Applied Mathematics Option (36 credits)

| Code                                                        | Title                                             | Credits |
|-------------------------------------------------------------|---------------------------------------------------|---------|
| <b>Additional Courses</b>                                   |                                                   |         |
| <i>Additional Courses: Require a grade of C or better</i>   |                                                   |         |
| Select 6 credits from CMPSC 221 or higher, except CMPSC 360 |                                                   | 6       |
| Select five of the following:                               |                                                   | 15      |
| MATH 310                                                    | Elementary Combinatorics                          |         |
| MATH 412                                                    | Fourier Series and Partial Differential Equations |         |
| MATH 449                                                    | Applied Ordinary Differential Equations           |         |
| MATH 455                                                    | Introduction to Numerical Analysis I              |         |
| MATH 456                                                    | Introduction to Numerical Analysis II             |         |
| MATH 482                                                    | Mathematical Methods of Operations Research       |         |
| STAT 414                                                    | Introduction to Probability Theory                |         |
| STAT 461                                                    | Analysis of Variance                              |         |
| STAT 462                                                    | Applied Regression Analysis                       |         |
| STAT 464                                                    | Applied Nonparametric Statistics                  |         |
| STAT 466                                                    | Survey Sampling                                   |         |

Select two of the following: 6

MATH 421 Complex Analysis  
MATH 426 Introduction to Modern Geometry  
MATH 427 Foundations of Geometry  
MATH 429 Introduction to Topology  
MATH 435 Basic Abstract Algebra  
MATH 436 Linear Algebra  
MATH 465 Number Theory

## Supporting Courses and Related Areas

*Supporting Courses and Related Areas: Require a grade of C or better*

Select 9 credits from a school-approved list 9

## Business Option (43 credits)

A maximum of 30 credits through the School of Business may be used to fulfill General Education, Major Requirements and Option Requirements.

| Code                                                      | Title                                                   | Credits |
|-----------------------------------------------------------|---------------------------------------------------------|---------|
| <b>Prescribed Courses</b>                                 |                                                         |         |
| <i>Prescribed Courses: Require a grade of C or better</i> |                                                         |         |
| ACCTG 211                                                 | Financial and Managerial Accounting for Decision Making | 4       |

|          |                                                |   |
|----------|------------------------------------------------|---|
| ECON 102 | Introductory Microeconomic Analysis and Policy | 3 |
| ECON 104 | Introductory Macroeconomic Analysis and Policy | 3 |
| MIS 204  | Introduction to Management Information Systems | 3 |

**Additional Courses**

*Additional Courses: Require a grade of C or better*

Select 6 credits from CMPSC 221 or higher, except CMPSC 360, and MIS 336 6

Select two of the following: 6

|          |                                   |
|----------|-----------------------------------|
| ECON 481 | Business Forecasting Techniques   |
| ECON 485 | Econometric Techniques            |
| FIN 301  | Corporation Finance               |
| FIN 405  | Advanced Financial Management     |
| FIN 420  | Investment and Portfolio Analysis |
| FIN 427  | Derivative Securities             |
| MGMT 301 | Basic Management Concepts         |
| MGMT 331 | Management and Organization       |
| MGMT 341 | Human Resource Management         |
| MKTG 301 | Principles of Marketing           |

Select two of the following: 6

|          |                                             |
|----------|---------------------------------------------|
| MATH 482 | Mathematical Methods of Operations Research |
| MIS 336  | Database Management Systems                 |
| MIS 430  | Systems Analysis                            |
| MIS 435  | Systems Design and Implementation           |
| MIS 445  | Business Intelligence                       |
| STAT 414 | Introduction to Probability Theory          |
| STAT 461 | Analysis of Variance                        |
| STAT 462 | Applied Regression Analysis                 |
| STAT 464 | Applied Nonparametric Statistics            |
| STAT 466 | Survey Sampling                             |

Select two of the following: 6

|          |                                 |
|----------|---------------------------------|
| MATH 421 | Complex Analysis                |
| MATH 426 | Introduction to Modern Geometry |
| MATH 427 | Foundations of Geometry         |
| MATH 429 | Introduction to Topology        |
| MATH 435 | Basic Abstract Algebra          |
| MATH 436 | Linear Algebra                  |
| MATH 465 | Number Theory                   |

**Supporting Courses and Related Areas**

*Supporting Courses and Related Areas: Require a grade of C or better*

Select 6 credits from a school-approved list 6

**Computer Science Option (36 credits)**

| Code | Title | Credits |
|------|-------|---------|
|------|-------|---------|

**Prescribed Courses**

*Prescribed Courses: Require a grade of C or better*

|           |                                      |   |
|-----------|--------------------------------------|---|
| CMPSC 455 | Introduction to Numerical Analysis I | 3 |
| CMPSC 465 | Data Structures and Algorithms       | 3 |

**Additional Courses**

*Additional Courses: Require a grade of C or better*

|           |                                                               |   |
|-----------|---------------------------------------------------------------|---|
| CMPSC 221 | Object Oriented Programming with Web-Based Applications       | 3 |
|           | or SWENG 311 Object-Oriented Software Design and Construction |   |
| CMPSC 312 | Computer Organization and Architecture                        | 3 |

|                              |  |
|------------------------------|--|
| or CMPEN 351 Microprocessors |  |
|------------------------------|--|

Select 12 credits from CMPSC courses at the 300- and 400-level 12

**Supporting Courses and Related Areas**

*Supporting Courses and Related Areas: Require a grade of C or better*

Select 12 credits from a school-approved list 12

**Pure Mathematics Option (36 credits)**

| Code | Title | Credits |
|------|-------|---------|
|------|-------|---------|

**Additional Courses**

*Additional Courses: Require a grade of C or better*

Select six of the following: 18

|          |                                                   |
|----------|---------------------------------------------------|
| MATH 310 | Elementary Combinatorics                          |
| MATH 412 | Fourier Series and Partial Differential Equations |
| MATH 421 | Complex Analysis                                  |
| MATH 426 | Introduction to Modern Geometry                   |
| MATH 427 | Foundations of Geometry                           |
| MATH 429 | Introduction to Topology                          |
| MATH 435 | Basic Abstract Algebra                            |
| MATH 436 | Linear Algebra                                    |
| MATH 455 | Introduction to Numerical Analysis I              |
| MATH 456 | Introduction to Numerical Analysis II             |
| MATH 465 | Number Theory                                     |
| MATH 482 | Mathematical Methods of Operations Research       |
| STAT 414 | Introduction to Probability Theory                |
| STAT 461 | Analysis of Variance                              |
| STAT 462 | Applied Regression Analysis                       |
| STAT 464 | Applied Nonparametric Statistics                  |
| STAT 466 | Survey Sampling                                   |

Select three of the following: 9

|          |                          |
|----------|--------------------------|
| MATH 403 | Classical Analysis I     |
| MATH 421 | Complex Analysis         |
| MATH 429 | Introduction to Topology |
| MATH 435 | Basic Abstract Algebra   |

**Supporting Courses and Related Areas**

*Supporting Courses and Related Areas: Require a grade of C or better*

Select 9 credits from a school-approved list 9

**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/general-education/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-83-00-degree-requirements/>)). For more information, check the Suggested Academic Plan for your intended program.