MATHEMATICS, B.A. (ALTOONA)

Begin Campus: Any Penn State Campus

End Campus: Altoona

Program Description

Two degrees are offered in mathematics: the Bachelor of Arts and the Bachelor of Science. Both programs have a common core of mathematics courses; both programs prepare students for graduate work in mathematics. In addition, the Bachelor of Arts degree is oriented toward applications of mathematics in the arts and the humanities. The Bachelor of Science degree has a number of options. These options are oriented toward actuarial science, applied and industrial mathematics, computational mathematics, graduate study and systems analysis.

Many of the options are designed for students who want to use mathematics in industry, commerce, or government. In short, the degree requirements have the flexibility to fit many individual interests. The student, with the assistance of a faculty adviser, should select an option by the end of the sophomore year.

What is Mathematics?

The study of mathematics emphasizes careful problem analysis, precision of thought and expression, and the development of mathematical skills needed for work in many other areas. Theoretical mathematicians increase basic knowledge in "pure" fields like abstract algebra, analysis, or topology. Applied mathematicians use tools growing out of calculus, analysis, computing, statistics, and operations research to solve problems in science, industry, government, and other areas.

You Might Like This Program If...

- You want to take a broad liberal arts program with a strong mathematical foundation.
- You want mathematics to complement your study of other subjects.
- You like mathematics, like to think, like a challenge, and like to know why things are true.
- You want to develop strong problem-solving skills, comprehension of abstract concepts, and creative thinking ability.

Entrance to Major

In order to be eligible for entrance to the Mathematics major, a student must have:

1. attained at least a 2.00 cumulative grade-point average; and
2. completed MATH 140 and MATH 141 and earned a grade of C or better in each of these courses.

Degree Requirements

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

Requirement	Credits
General Education	45
Electives	0-1
Bachelor of Arts Degree Requirements	24
Requirements for the Major	56

6 of the 45 credits for General Education are included in the Requirements for the Major. This includes 6 credits of General Education GQ courses.

3 of the 24 credits for Bachelor of Arts Degree Requirements are included in the Requirements for the Major, General Education, or Electives and 0-12 credits are included in Electives if foreign language proficiency is demonstrated by examination.

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 (http://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.)
- **Quantification (GQ):** 6 credits
- **Writing and Speaking (GWS):** 9 credits

Knowledge Domains
- **Arts (GA):** 6 credits
- **Health and Wellness (GHW):** 3 credits
- **Humanities (GH):** 6 credits
- **Social and Behavioral Sciences (GS):** 6 credits
- **Natural Sciences (GN):** 9 credits

Integrative Studies (may also complete a Knowledge Domain requirement)
- **Inter-Domain or Approved Linked Courses:** 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 (http://senate.psu.edu/policies-and-rules-for-undergraduate-students/82-00-and-83-00-degree-requirements/#83-80)). For more information, check the Suggested Academic Plan for your intended program.

B.A. Degree Requirements
Foreign Language (0-12 credits): Student must attain 12th credit level of proficiency in one foreign language. See the Placement Policy for Penn State Foreign Language Courses (http://bulletins.psu.edu/undergraduate/general-information/academic-information/advising-planning-degree-program/course-placements/placement-policy-world-language-courses).

B.A. Fields (9 credits): Humanities, Social and Behavioral Sciences, Arts, Foreign Languages, Natural Sciences, Quantification (may not be taken in the area of the student's primary major; foreign language credits in this category must be in a second foreign language or beyond the 12th credit level of proficiency in the first language)

Other Cultures (0-3 credits): Select 3 credits from approved list. Students may count courses in this category in order to meet other major, minor, elective, or General Education requirements, except for the General Education US/IL requirement.

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 (http://senate.psu.edu/policies-and-rules-for-undergraduate-students/82-00-and-83-00-degree-requirements/#82-44).

Code	Title	Credits
Prescribed Courses		
STAT 200	Elementary Statistics	4
Prescribed Courses: 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
MATH 403	Classical Analysis I	3
Additional Courses		
Select one of the following:		3
CMPSC 101	Introduction to Programming	
CMPSC 121	Introduction to Programming Techniques	
CMPSC 201	Programming for Engineers with C++	
Additional Courses: Require a grade of C or better		
MATH 250	Ordinary Differential Equations	3-4
or MATH 251	Ordinary and Partial Differential Equations	
MATH 435	Basic Abstract Algebra	3
or MATH 436	Linear Algebra	
Select 3 credits of the following:		3
MATH 411	Ordinary Differential Equations	
MATH 412	Fourier Series and Partial Differential Equations	
MATH 417	Qualitative Theory of Differential Equations	
MATH 419	Theoretical Mechanics	
MATH 421	Complex Analysis	
Select 6 credits of 400-level MATH courses [1]		6
Supporting Courses and Related Areas		
Select 8-11 credits from department list		8-11

[1] Select 6 credits of 400-level MATH courses except:
- MATH 401
- MATH 405
- MATH 406
- MATH 441
- MATH 470
- MATH 471

Program Learning Objectives

1. Students should be able to demonstrate a strong understanding of the core concepts of differential and integral calculus, elementary linear algebra, and differential equations, and to use these concepts to describe physical problems mathematically.
2. Students should develop an understanding of mathematical proof techniques, and demonstrate skill in the effective communication of mathematical concepts and proofs, especially in written form.
3. Students should demonstrate an understanding of advanced mathematical concepts and their use to solve problems both from within mathematics and from applied areas.
4. Graduating students should be prepared to cope with the mathematical challenges they meet in continuing their mathematical education or at the workplace.

Academic Advising

The objectives of the university's academic advising program are to help advisees identify and achieve their academic goals, to promote their intellectual discovery, and to encourage students to take advantage of both in-and out-of class educational opportunities in order that they become self-directed learners and decision makers.

Both advisers and advisees share responsibility for making the advising relationship succeed. By encouraging their advisees to become engaged in their education, to meet their educational goals, and to develop the

habit of learning, advisers assume a significant educational role. The advisee's unit of enrollment will provide each advisee with a primary academic adviser, the information needed to plan the chosen program of study, and referrals to other specialized resources.

READ SENATE POLICY 32-00: ADVISING POLICY (http://senate.psu.edu/policies-and-rules-for-undergraduate-students/32-00-advising-policy)

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Suggested Academic Plan

The suggested academic plan(s) listed on this page are the plan(s) that are in effect during the 2019-20 academic year. To access previous years' suggested academic plans, please visit the archive (http://bulletins.psu.edu/undergraduate/archive) to view the appropriate Undergraduate Bulletin edition (*Note: the archive only contain suggested academic plans beginning with the 2018-19 edition of the Undergraduate Bulletin*).

Altoona Campus

The course series listed below provides **only one** of the many possible ways to move through this curriculum. The University may make changes in policies, procedures, educational offerings, and requirements at any time. This plan should be used in conjunction with your degree audit (accessible in LionPATH as either an **Academic Requirements** or **What If** report). Please consult with a Penn State academic adviser on a regular basis to develop and refine an academic plan that is appropriate for you.

First Year

Fall	Credits	Spring	Credits
MATH 140*#	4	MATH 141*#	4
General Education Course	3	General Education Course	3
World Language Course Level 1	4	World Language Course Level 2	4
STAT 200‡	4	ENGL 15, 30, or ESL 15‡	3
		General Education Course (GHW)	1.5
	15		15.5

Second Year

Fall	Credits	Spring	Credits
MATH 220‡	2	MATH 250 or 251	3 or 4
MATH 230	4	MATH 311W*	3
World Language Course Level 3	4	CMPSC 121 or 201‡	3
General Education Course	3	CAS 100‡	3
General Education Course	3	General Education (GHW)	1.5
	16		13.5-14.5

Third Year

Fall	Credits	Spring	Credits
MATH 312*	3	MATH 403*	3
MATH 435 or 436*	3	Mathematics 400-level Course*	3
Supporting Course	3 or 4	Supporting Course	3 or 4
Other Cultures Course (IL)	3	ENGL 202C‡	3
General Education Course	3	General Education Course	3
	15-16		15-16

Fourth Year

Fall	Credits	Spring	Credits
Mathematics 400-level Course*	3	Mathematics 400-level Course*	3
Other Cultures Course (IL)	3	Supporting Course	3 or 4
General Education Course	3	General Education Course	3
General Education Course	3	General Education Course	3
General Education Course	3	General Education Course	3
	15		15-16

Total Credits 120-124

*	Course requires a grade of C or better for the major
‡	Course requires a grade of C or better for General Education
#	Course is an Entrance to Major requirement
†	Course satisfies General Education and degree requirement

University Requirements and General Education Notes:

US and IL are abbreviations used to designate courses that satisfy University Requirements (United States and International Cultures).

W, M, X, and Y are the suffixes at the end of a course number used to designate courses that satisfy University Writing Across the Curriculum requirement.

GWS, GQ, GHW, GN, GA, GH, and GS are abbreviations used to identify General Education program courses. General Education includes Foundations (GWS and GQ) and Knowledge Domains (GHW, GN, GA, GH, GS, and Integrative Studies). Foundations courses (GWS and GQ) require a grade of 'C' or better.

Integrative Studies courses are required for the General Education program. N is the suffix at the end of a course number used to designate an Inter-Domain course and Z is the suffix at the end of a course number used to designate a Linked course.

Bachelor of Arts Requirements:

Bachelor of Arts students must take 9 credits in Bachelor of Arts (B.A.) Fields (Humanities; Social and Behavioral Sciences; Arts; World Languages [2nd language or beyond the 12th credit level of proficiency in the 1st]; Natural Sciences; Quantification). The B.A. Fields courses may not be taken in the area of the student's primary major. See your adviser and the Degree Requirements section (http://bulletins.psu.edu/undergraduate/general-information/academic-information) of this Bulletin.

Bachelor of Arts students must take 3 credits in Other Cultures.

See your adviser and the full list of courses approved as Other Cultures courses (http://bulletins.psu.edu/undergraduate/general-education/course-lists/ba-other-cultures).

Career Paths

Students with an undergraduate degree in mathematics pursue graduate study or careers in business and industry.

Careers

Students with an undergraduate degree in mathematics pursue careers in the fields of science and technology, business and consulting, research and industry, and teaching.

MORE INFORMATION ABOUT POTENTIAL CAREER OPTIONS FOR GRADUATES OF THE MATHEMATICS PROGRAM (https://math.psu.edu/undergraduate/advising/careers)

Opportunities for Graduate Studies

Students with an undergraduate degree in mathematics pursue graduate study in a variety of different fields such as mathematics, statistics, economics, finance, computer science, or operations research.

MORE INFORMATION ABOUT OPPORTUNITIES FOR GRADUATE STUDIES (https://math.psu.edu/undergraduate/advising/careers)

Professional Resources

- Mathematical Association of America (http://www.maa.org)
- American Mathematical Society (http://www.ams.org/home/page)
- Society of Industrial and Applied Mathematics (https://www.siam.org)

Contact

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