MATHEMATICS

The program in mathematics offers training for students planning to work in mathematics and computation for industry, to continue their studies in graduate school, or to enter secondary education teaching. Students may satisfy the major requirements in several ways, which are designed to meet these various career objectives.

Student Learning Outcomes

Our graduates will

- understand the fundamentals of a broad range of areas of mathematics, including algebra, analysis, discrete mathematics, geometry, and numerical analysis.
- demonstrate problem solving skills, critical thinking, and analytical reasoning as applied to mathematical problems and modeling.
- construct and effectively communicate rigorous arguments to demonstrate mathematical facts in oral, written, and electronic formats.
- participate in meaningful learning experiences, recognize the central role of mathematics in our society, and develop an appreciation for mathematics as a fundamental intellectual pursuit.

Curriculum

As majors in the College of Liberal Arts and Sciences, Math students must meet College of Liberal Arts and Sciences (http://catalog.iastate.edu/previouscatalogs/2023-2024/collegeofliberalartsandsciences/#lascollegerequirementstext) and University-wide requirements (http://catalog.iastate.edu/previouscatalogs/2023-2024/collegescurricula/) for graduation in addition to those stated below for the major.

Mathematics Core

All Math majors are required to earn credit for the following core courses:

MATH 101	Orientation in Mathematics	1
MATH 165	Calculus I	4
MATH 166	Calculus II	4
MATH 201	Introduction to Proofs	3
MATH 265	Calculus III	4
One of the following:		3-4
MATH 317	Theory of Linear Algebra	
MATH 407	Applied Linear Algebra	
Total Credits		**19-20**

To complete the major, leading to a Bachelor of Science degree, students must choose from one of the following four pathways:

Standard Mathematics Major

This degree program is designed for students planning to work in industry or those who plan to continue their studies mathematics at the graduate level. Students are required to earn credit for the following courses:

One of the following:		3-4
MATH 266	Elementary Differential Equations	
MATH 267	Elementary Differential Equations and Laplace Transforms	
MATH 301	Abstract Algebra I	3
MATH 414	Analysis I	3
Additional MATH courses at the 300, 400, or 500 level		15
Total Credits		**24-25**

Additionally, the courses must include one of the following sequences:

MATH 301 & MATH 403	Abstract Algebra I and Intermediate Abstract Algebra	6
MATH 304 & MATH 314	Combinatorics and Graph Theory	6
MATH 373 & MATH 481	Introduction to Scientific Computing and Numerical Methods for Differential Equations	6
MATH 414 & MATH 415	Analysis I and Analysis II	6
MATH 435 & MATH 436	Geometry I and Geometry II	6

Mathematics Major with Actuarial Science Certificate

This degree program is designed for students pursuing a career as an actuary or in the financial sector. Students are required to earn credit for the following courses:

MATH 240	Mathematics of Investment and Credit	3
MATH 341	Introduction to the Theory of Probability and Statistics I	4
MATH 414	Analysis I	3
MATH 441	Life Contingencies I	3
MATH 442	Life Contingencies II	3
Total Credits		**16**

Additionally, students must meet the requirements for the Actuarial Science Certificate (see www.catalog.iastate.edu/collegeofbusiness/actuarialscience/#certificatetext (http://catalog.iastate.edu/previouscatalogs/2023-2024/collegeofbusiness/actuarialscience/#certificatetext)).

Mathematics Major with Applications

This degree program is for students who want to specialize in the application of mathematics to an area of study. It is recommended for those who plan to work in industry or those who plan to continue studying their specialization area at the graduate level. Students are required to earn credit for the following courses:

One of the following:		3-4
MATH 266	Elementary Differential Equations	
MATH 267	Elementary Differential Equations and Laplace Transforms	
Four of the following:		12-13
MATH 301	Abstract Algebra I	
MATH 304	Combinatorics	
MATH 314	Graph Theory	
MATH 341	Introduction to the Theory of Probability and Statistics I	
MATH 350	Number Theory	
MATH 365	Complex Variables with Applications	
MATH 373	Introduction to Scientific Computing	
MATH 385	Introduction to Partial Differential Equations	
MATH 414	Analysis I	
MATH 421	Logic for Mathematics and Computer Science	
MATH 423	Mathematical Modeling in Biology	
MATH 424	Introduction to High Performance Computing	
MATH 469	Introduction to Discrete Mathematics	
MATH 481	Numerical Methods for Differential Equations	
Courses at the 300, 400, or 500 level from the following designations: AER E, A B E, ASTRO, BBMB, BCB, BCBIO, BIOL, B M E, B M S, CH E, CHEM, C E, CPR E, COM S, CON E, DS, ECON, E E, E M, ENSCI, FIN, GEN, GEOL, I E, MAT E, M E, MIS, MTEOR, MICRO, NUC E, PHIL, PYSCH, PHYS, S E, SOC, STAT		12
Total Credits		**27-29**

Mathematics Major for Teacher Preparation

This degree program prepares students for a career in secondary education.

All students preparing to become teachers need to complete the core Math classes required of all Math majors, the courses laid out below, and the requirements of the Secondary Major in Education (http://catalog.iastate.edu/previouscatalogs/2023-2024/collegeofhumansciences/educationsecondary/#curriculumtext) including Student Teaching. Note: Teacher license requirements are established by the Iowa Department of Education and the Iowa Board of Educational Examiners and are subject to change. Recent changes may not be reflected in this catalog, but advisers and faculty will be aware.

COM S 107	Windows Application Programming	3-4
or COM S 207	Fundamentals of Computer Programming	
or COM S 227	Object-oriented Programming	
STAT 201	Introduction to Statistical Concepts and Methods	4
MATH 266	Elementary Differential Equations	3-4
or MATH 267	Elementary Differential Equations and Laplace Transforms	
MATH 301	Abstract Algebra I	3
MATH 341	Introduction to the Theory of Probability and Statistics I	4
MATH 414	Analysis I	3
MATH 435	Geometry I	3
MATH 436	Geometry II	3
MATH 397	Teaching Secondary Mathematics Using University Mathematics	3
MATH 497	Teaching Secondary School Mathematics	3
Total Credits		**32-34**

Complementary Coursework for Teacher Preparation

In addition to the courses required for the Math Major and those required for the Secondary Major in Education, (http://catalog.iastate.edu/previouscatalogs/2023-2024/collegeofhumansciences/educationsecondary/#curriculumtext) the complementary coursework below is required for those seeking licensure in mathematics. Some of these courses, and some of the required coursework for the Secondary Major in Education (http://catalog.iastate.edu/previouscatalogs/2023-2024/collegeofhumansciences/educationsecondary/#curriculumtext), can also apply to LAS general education requirements.

PSYCH 230	Developmental Psychology	3
or HD FS 102	Human Development	
EDUC 280J	Pre-Student Teaching Experience I: Mathematics Clinic	1
EDUC 480C	Pre-Student Teaching Experience III: Mathematics	0.5-2
And one course in American History or Government		3
Total Credits		**7.5-9**

University and College Requirements

In addition to the core and pathway courses, students are also required to earn credit for the following courses:

Courses from General Education Area I - Arts and Humanities [1]	12
Courses from General Education Area IIB - Natural Sciences [1]	8

Courses from General Education Area III - Social Sciences [1]		9
LAS Career Proficiency Requirement (LAS 203)		1
Courses meeting the international perspectives requirement [2]		3
Courses meeting the U.S. diversity requirement [2]		3
LIB 160	Introduction to College Level Research	1
ENGL 150	Critical Thinking and Communication	3
ENGL 250	Written, Oral, Visual, and Electronic Composition [3]	3
One of the following: [4]		3
ENGL 302	Business Communication	
ENGL 303	Free-Lance Writing for Popular Magazines	
ENGL 305	Creative Writing: Nonfiction	
ENGL 309	Proposal and Report Writing	
ENGL 314	Technical Communication	
MATH 491	Undergraduate Thesis [5]	

[1] Possible choices can be found here: https://las.iastate.edu/students/academics/general-education/

[2] Courses used to meet the U.S. Diversity and International Perspectives requirements can also be used to fulfill general education requirements.

[3] Students must earn a grade of C or better.

[4] Students must earn a grade of C- or better.

[5] With departmental approval.

Furthermore, students must earn a minimum of 120 credits, including a minimum of 45 credits at the 300 or 400 level, and including at least 8 credits in the major at the 300/400 level with a grade of C or better. At least 55 of these credits must be earned at a four-year institution, and the last 32 credits must be earned at Iowa State University. A maximum of 16 technical credits are allowed, and a maximum of 9 P-NP credits of free electives may apply. Students must also meet the LAS World Language requirement and have a minimum 2.00 ISU cumulative Grade Point Average.

Four Year Plans
Mathematics Major

Freshman

Fall	Credits	Spring	Credits
MATH 101	1	MATH 166	4
MATH 165	4	Arts & Humanities Choice	3
ENGL 150	3	Natural Science Choice	4
LIB 160	1	Social Science Choice	3
Natural Science Choice	4		
Electives	3		
	16		**14**

Sophomore

Fall	Credits	Spring	Credits
MATH 201	3	MATH 266 or 267	3-4
MATH 265	4	MATH 317	4
Arts & Humanities Choice	3	ENGL 250	3
Social Science Choice	3	Social Science Choice	3
Electives	3	LAS 203	1
	16		**14-15**

Junior

Fall	Credits	Spring	Credits
MATH Sequence Course I	3	MATH Sequence Course II	3
MATH 301 or 414	3	MATH 414 or 301	3
Arts & Humanities Choice	3	Communication Choice	3
Electives/World Language	6	Electives/World Language	6
	15		**15**

Senior

Fall	Credits	Spring	Credits
MATH 300+	3	MATH 300+	6
Arts & Humanities Choice	3	Electives	9
Electives	9		
	15		**15**

Total Credits: 120-121

Mathematics Major with Actuarial Science Certificate

Freshman

Fall	Credits	Spring	Credits
MATH 101	1	MATH 166	4
MATH 165	4	ECON 102	3
ENGL 150	3	STAT 226	3
LIB 160	1	ACCT 284	3
ECON 101	3	Electives	3
Electives	3		
	15		**16**

Sophomore

Fall	Credits	Spring	Credits
MATH 201	3	MATH 240	3
MATH 265	4	MATH 317	4
FIN 301	3	ENGL 250	3
Arts & Humanities Choice	3	FIN 320	3
Electives	3	Arts & Humanities Choice	3
LAS 203	1		
	17		**16**

Junior

Fall	Credits	Spring	Credits
STAT 341	4	FIN 424	3
STAT 301 or 326	3-4	STAT 342	4
Natural Science Choice	4	Communication Choice	3
Electives/World Language	3	Natural Science Choice	4
		Electives/World Language	3
	14-15		**17**

Senior

Fall	Credits	Spring	Credits
MATH 414	3	MATH 442	3
MATH 441	3	Social Science Choice	3
Arts & Humanities Choice	3	Electives	9
Electives	6		
	15		**15**

Total Credits: 125-126

Mathematics Major with Applications

Freshman

Fall	Credits	Spring	Credits
MATH 101	1	MATH 166	4
MATH 165	4	Arts & Humanities Choice	3
ENGL 150	3	Natural Science Choice	4
LIB 160	1	Social Science Choice	3
Natural Science Choice	4	Specialization Area Prereq.	3
Specialization Area Prereq.	3		
	16		**17**

Sophomore

Fall	Credits	Spring	Credits
MATH 201	3	MATH 266 or 267	3-4
MATH 265	4	MATH 317	4
Arts & Humanities Choice	3	ENGL 250	3
Social Science Choice	3	Social Science Choice	3
Specialization Area Prereq.	3	LAS 203	1
	16		**14-15**

Junior

Fall	Credits	Spring	Credits
MATH 300+ or MATH 304	3	MATH 300+ or MATH 314	3
Specialization Area 300+	3	Specialization Area 300+	3
Arts & Humanities Choice	3	Communication Choice	3
Electives/World Language	6	Electives/World Language	6
	15		**15**

Senior

Fall	Credits	Spring	Credits
MATH 300+	3	MATH 300+	3
Specialization Area 300+	3	Specialization Area 300+	3
Arts & Humanities Choice	3	Electives	9
Electives	6		
	15		**15**

Total Credits: 123-124

Mathematics Major for Teacher Preparation

Freshman

Fall	Credits	Spring	Credits
MATH 101	1	MATH 166	4
MATH 165	4	STAT 201	4
ENGL 150	3	EDUC 219	1
LIB 160	1	EDUC 280J	1
PSYCH 230 or HD FS 102	3	EDUC 202	3
Arts & Humanities Choice	3	Arts & Humanities Choice	3
	15		**16**

Sophomore

Fall	Credits	Spring	Credits
MATH 201	3	MATH 266 or 267	3-4
MATH 265	4	MATH 317	4
ENGL 250	3	PSYCH 333	3
EDUC 204	3	COM S 107, 207, or 227	3-4
Natural Science Choice	4	Natural Science Choice	4
LAS 203	1		
	18		**17-19**

Junior

Fall	Credits	Spring	Credits
MATH 301	3	MATH 397	3
MATH 341	4	MATH 436	3
MATH 435	3	EDUC 280A	1-2
EDUC 406	3	SP ED 401	3
Communication Choice	3	Social Sciences Choice	3
		Arts & Humanities Choice	3
	16		**16-17**

Senior

Fall	Credits	Spring	Credits
MATH 414	3	EDUC 417C	16
MATH 497	3		
EDUC 395	3		
EDUC 480C	0.5-2		

Arts & Humanities Choice	3	
	12.5-14	**16**

Total Credits: 126.5-131

Undergraduate Minor

The department offers a minor in mathematics. The minor requires at least 16 credits, including at least 6 credits in courses numbered 300 or above taken at Iowa State University. At least 9 credits must apply exclusively towards the minor and cannot be used to meet any other department, college, or university requirement. Students are required to earn credit for the following courses:

MATH 201	Introduction to Proofs	3
MATH 265	Calculus III	4
One of the following:		3-4
MATH 266	Elementary Differential Equations	
MATH 267	Elementary Differential Equations and Laplace Transforms	
One of the following:		3-4
MATH 317	Theory of Linear Algebra	
MATH 407	Applied Linear Algebra	
One of the following:		3-4
MATH 301	Abstract Algebra I	
MATH 304	Combinatorics	
MATH 314	Graph Theory	
MATH 341	Introduction to the Theory of Probability and Statistics I	
MATH 350	Number Theory	
MATH 365	Complex Variables with Applications	
MATH 373	Introduction to Scientific Computing	
MATH 385	Introduction to Partial Differential Equations	
MATH 414	Analysis I	
MATH 421	Logic for Mathematics and Computer Science	
MATH 423	Mathematical Modeling in Biology	
MATH 435	Geometry I	
MATH 436	Geometry II	
MATH 469	Introduction to Discrete Mathematics	
Total Credits		**16-19**

Graduate Study

The department offers programs leading to a Master of Science or Doctor of Philosophy degree in mathematics or applied mathematics, as well as minor work for students whose major is in another department.

Students desiring to undertake graduate work leading to the M.S. or Ph.D. degree should prepare themselves by taking several upper division mathematics courses.

The M.S. degree requires a student to take at least 30 credit hours and to write a creative component or thesis. Additionally, students must pass a comprehensive oral examination over their coursework and their creative component or thesis. See the online Mathematics Graduate Handbook for specific requirements.

The Ph.D. degree requires a student to take 42 credit hours of coursework in addition to research hours, pass written qualifying examinations, pass an oral preliminary exam, and perform an original research project culminating in a dissertation which is defended by an oral exam. Ph.D. candidates must have at least one year of supervised teaching experience. See the on-line Mathematics Graduate Handbook for specific requirements.