Mathematics, BS

Bachelor of Science students majoring in mathematics enroll in one of three programs: Program A is for students who plan to work in business or government or pursue graduate study in mathematics; Program B is for students who seek secondary school teaching licensure; and Program C is for those seeking specialization in a mathematics-related area, such as actuarial science, biochemistry, biomathematics, biostatistics, chemistry, computer science, data science, economics, engineering (all departments), finance, physics, risk management and insurance, statistics, and so forth. Program C may be especially appropriate for students who plan to seek a mathematics-related job after earning a bachelor's degree, rather than going on to graduate study.

Learning Outcomes

Math majors will be able to:

- give correct, logical mathematical proofs using mathematical terminology and hypotheses;
- reason logically and quantitatively using algebraic, analytic, and numerical methods;
- incorporate mathematical ideas and reasoning into well-written English; and
- model and analyze problems in pure mathematics and in other disciplines.

BS with Second Major

Students majoring in mathematics may choose to earn a second major in computer science, statistics, actuarial science, or other disciplines. They must satisfy all requirements of Program A, Program B, or Program C in mathematics as well as all requirements for the second major. For more information, consult an advisor and see Declaring or Changing a Major on the College of Liberal Arts and Sciences website.

Transfer from Engineering to Mathematics

Certain engineering students who have completed MATH:1550 Engineering Mathematics I: Single Variable Calculus, MATH:1560 Engineering Mathematics II: Multivariable Calculus, MATH:2550 Engineering Mathematics III: Matrix Algebra, MATH:2560 Engineering Mathematics IV: Differential Equations, or MATH:3550 Engineering Mathematics V: Vector Calculus may count these courses toward the major in mathematics. See the Department of Mathematics website.

Requirements

The Bachelor of Science with a major in mathematics requires a minimum of 120 s.h., including at least 44–56 s.h. (13–14 courses) of work for the major. Total credit for the major depends on a student's choice of Program A, B, or C. Students must maintain a grade-point average of at least 2.00 in all courses for the major and in all UI courses for the major. They also must complete the College of Liberal Arts and Sciences GE CLAS Core.

All students complete the post-calculus mathematics requirement, the upper-level mathematics requirement, and the requirements for Program A, B, or C.

For policies concerning transfer credit, correspondence credit, credit by examination, cumulative grade-point average, general rules relating to regression and duplication, and so forth, see For Undergraduate Students on the College of Liberal Arts and Sciences website.

For information about duplication, regression, and use of the second-grade-only option for mathematics courses, contact the Department of Mathematics or visit the Department of Mathematics website. The website also provides details about schedule planning and career options for mathematics students. For more information on admission, financial support, employment opportunities, the faculty, facilities, and other topics, visit the Department of Mathematics or the University of Iowa website.

The BS with a major in mathematics (Program A, B, or C) requires the following coursework.

Requirements	Hours
Program Requirements (semester hours vary in Program A, B, or C selection)	44-56

Post-Calculus Mathematics Requirement

Students majoring in mathematics must earn at least 15 s.h. in post-calculus mathematics courses (prefix MATH) offered by the Department of Mathematics or cross-referenced with a mathematics course at the University of Iowa; students may not count transfer courses or credit by exam toward this requirement.

Post-calculus courses in the Department of Mathematics are numbered 2000 or above, excluding these:

Course #	Title	Hours
MATH:3700	Introduction to Matrix Theory	3
MATH:3750	Classical Analysis	4
MATH:3995	Topics in Mathematics	3
MATH:3996	Individual Study and Honors in Mathematics	arr.
MATH:3997	Readings in Mathematics	arr.
MATH:4010	Basic Analysis	3
MATH:4020	Basic Abstract Algebra	3

Upper-Level Mathematics Requirement

Mathematics majors must take at least two upper-level mathematics courses (three in Program A) for the BS degree. Upper-level mathematics courses include MATH:3900 Introduction to Mathematics Research and courses numbered 4000 or above, excluding these:

Course #	Title	Hours
MATH:4010	Basic Analysis	3
MATH:4020	Basic Abstract Algebra	3
MATH:4120	History of Mathematics	3

No courses from other departments can be counted as upper-level mathematics courses, unless they are cross-referenced with an upper-level mathematics course (prefix MATH).

Program A

Program A is primarily for students who plan to work in business or government or to pursue graduate study in mathematics.

Program A: Core Courses

Students must complete a two-semester sequence of MATH:1850 Calculus I and MATH:1860 Calculus II. Advanced placement credit, CLEP credit, and credit granted through the Mathematics Incentive Program are accepted for all or part of the calculus requirement.

Students complete the following core courses.

Course #	Title	Hours
MATH:1850 & MATH:1860	Calculus I-II	8
MATH:2700	Introduction to Linear Algebra	4
MATH:2850	Calculus III	4
MATH:3600	Introduction to Ordinary Differential Equations	3
MATH:3720	Introduction to Abstract Algebra I	4
MATH:3770	Fundamental Properties of Spaces and Functions I	4

More advanced courses may be substituted for the core courses with Department of Mathematics approval.

Program A: Electives

Students complete six electives (18–24 s.h.), including at least four courses in the Department of Mathematics (prefix MATH). Of these four courses, at least three must be upper-level mathematics courses.

Mathematics

Students may choose from mathematics courses numbered MATH:2150 Foundations of Geometry, MATH:3800 Introduction to Numerical Methods, or courses above MATH:3800, excluding MATH:4010 Basic Analysis and MATH:4020 Basic Abstract Algebra.

Computer Science

Students may choose computer science courses numbered CS:1210 through CS:4740, excluding CS:3210 Programming Languages and Tools, CS:3910 Informatics Project, CS:3980 Topics in Computer Science I, and CS:3990 Honors in Computer Science or Informatics.

Statistics and Actuarial Science

Students may choose statistics courses numbered STAT:2020 Probability and Statistics for the Engineering and Physical Sciences, STAT:3100 through STAT:4740, STAT:5100 through STAT:5120, excluding STAT:3510 Biostatistics, STAT:4143 Introduction to Statistical Methods, and STAT:4200 Statistical Methods and Computing.

Among the courses listed above, only one of the following three courses can be counted toward the elective requirement: STAT:2020, STAT:3100, or STAT:3120. None of these courses can be counted as credit earned toward graduation if taken after STAT:4100 Mathematical Statistics I owing to regression policies.

Students may choose actuarial science courses numbered ACTS:3080 Mathematics of Finance I and ACTS:4130 through ACTS:4380.

Consult the Department of Mathematics website for a complete list of electives in computer science, and statistics and actuarial science.

Program B

Program B is intended for students seeking secondary school teaching licensure. Students who wish to earn teaching licensure in addition to earning a Bachelor of Science with a major in mathematics also must complete the Teacher Education Program (TEP); see "Teacher Licensure" below.

Program B: Core Courses

Students must complete a two-semester sequence of MATH:1850 Calculus I and MATH:1860 Calculus II. Advanced placement credit, CLEP credit, and credit earned through the Mathematics Incentive Program are accepted for part or all of the calculus requirement. Students complete the following core courses.

Course #	Title	Hours
MATH:1850 & MATH:1860	Calculus I-II	8
MATH:2150	Foundations of Geometry	3
MATH:2700	Introduction to Linear Algebra	4
MATH:2850	Calculus III	4
MATH:3720	Introduction to Abstract Algebra I	4
MATH:3770	Fundamental Properties of Spaces and Functions I	4
MATH:4050	Introduction to Discrete Mathematics	3
or MATH:4060	Discrete Mathematical Models	
CS:1210	Computer Science I: Fundamentals	4
STAT:3120	Probability and Statistics	4

More advanced courses may be substituted for the core courses with Department of Mathematics approval.

Program B: Electives

Students in Program B must take at least three additional Department of Mathematics post-calculus courses (9–12 s.h.), including two chosen from MATH:3900 Introduction to Mathematics Research and courses numbered 4000 or above, excluding MATH:4010 Basic Analysis and MATH:4020 Basic Abstract Algebra. The post-calculus courses must be chosen avoiding duplication and regression with the core math courses, particularly when engineering mathematics courses are considered. With the department's approval, capable students are encouraged to substitute more advanced courses in the same subject area for any of the electives. The Department of Mathematics website offers advice on course selection.

Teacher Licensure

Students interested in teaching in elementary and/or secondary schools should seek admission to the Teacher Education Program (TEP) in the College of Education.

To qualify for licensure in secondary teaching, students in the TEP complete a degree in education as well as a related

College of Liberal Arts and Sciences degree. See Apply on the College of Education website for details on requirements and deadlines for applying to the College of Education and about TEP choices of majors leading to licensure.

Students who wish to earn teacher licensure should choose Program B; see "Program B" above.

Program C

The Department of Mathematics encourages students of other majors to take more mathematics courses and attempt a BA or BS secondary major, or a secondary degree if their first major is outside CLAS, in mathematics. Program C offers a curricular path to achieve this goal.

Program C enables students to specialize in a mathematics-related subtrack, such as the mathematics of biochemistry, biomathematics, biostatistics, chemistry, computer science, data science, economics, engineering (all departments), finance, physics, risk management and insurance, and statistics and actuarial science. In consultation with the faculty advisor, students build on the Program C core to prepare a subtrack plan of study tailor-made to their interests and academic or career goals. The proposed study plan must be approved by the Department of Mathematics.

Students must file their subtrack plan of study before they begin their senior year; they use the Program C Plan of Study form, available on the Department of Mathematics website. The website has templates for choosing electives in several areas; students may use these or propose other plans.

Program C: Core Courses

Students must complete a two-semester sequence of MATH:1850 Calculus I and MATH:1860 Calculus II. Advanced placement credit, CLEP credit, and credit earned through the Mathematics Incentive Program are accepted for part or all of the calculus requirement. Students complete the following core mathematics courses.

Course #	Title	Hours
MATH:1850 & MATH:1860	Calculus I-II	8
MATH:2700	Introduction to Linear Algebra	4
MATH:2850	Calculus III	4
One additional "proofs" course such as MATH:3720 or MATH:3770		4

More advanced courses may be substituted for the core courses with Department of Mathematics approval.

Program C: Electives

Students choose at least eight approved electives. All electives must be offered for 3–4 s.h. of credit. At least four of the electives must be mathematics courses (prefix MATH): MATH:3600 Introduction to Ordinary Differential Equations or above, but excluding MATH:3700 Introduction to Matrix Theory, MATH:3750 Classical Analysis, MATH:3995 through MATH:3997, MATH:4010 Basic Analysis, MATH:4020 Basic Abstract Algebra, and MATH:4120 History of Mathematics. Independent study, reading, topics, seminar, and project courses are not allowed unless approved by the Department of Mathematics in advance. Of these four math courses, at least two courses must be upper-level mathematics courses. See "Post-Calculus Mathematics Requirement" and "Upper-Level Mathematics Requirement" above.

Some subtracks require additional required courses beyond the five core mathematics courses (see "Program C: Core Courses" above). These additional courses count toward electives; some may be from other departments. For a list of suggested subtracks and restrictions on electives as well as the additional required courses (if any) in each subtrack, consult the Department of Mathematics website.

Honors

Honors in the Major

Students majoring in mathematics have the opportunity to graduate with honors in the major. Students must maintain a cumulative University of Iowa grade-point average (GPA) of at least 3.33, as required by the College of Liberal Arts and Sciences; additionally, students must maintain a cumulative GPA of at least 3.40 in the major, a GPA set by the Department of Mathematics.

To graduate with honors in the major, students also must complete one of the options below.

Option 1

Students complete five upper-level mathematics courses as defined in "Upper-level Mathematics Requirement" under "Requirements." Mathematics courses (prefix MATH) numbered 6000 or above must be approved by the mathematics honor advisor in advance.

Sometimes an honors research project may only produce a research report but not a formal thesis. A research report will be counted as one upper-level math course towards option 1 by enrolling in MATH:3996 Individual Study and Honors in Mathematics for 3 s.h. A research report must be approved by the honors research project supervisor.

Option 2

Students complete three upper-level mathematics courses and write an honors thesis. A student who chooses this option must contact the Department of Mathematics honors advisor and find a faculty member who is willing to supervise their honors thesis project. The Department of Mathematics honors advisor will then appoint a thesis committee of at least two faculty members. The student will need to obtain preapproval at the beginning of their thesis project, midterm approval from the thesis committee, and pass a defense.

The Department of Mathematics encourages students to use their sole-authored or coauthored research papers as honors theses if the papers have been published, accepted, or submitted to a research journal. Satisfactory peer reviews or referee's reports may be accepted in lieu of preapproval and midterm approval.

University of Iowa Honors Program

In addition to honors in the major, students have opportunities for honors study and activities through membership in the University of Iowa Honors Program. Visit Honors at Iowa to learn about the university's honors program. Honors in mathematics is awarded by the Department of Mathematics and is separate from the University of Iowa Honors Program.

Membership in the UI Honors Program is not required to earn honors in the mathematics major. However, honors

in mathematics can be applied toward UI Honors Program requirements.

Career Advancement

The Pomerantz Career Center offers multiple resources to help students find internships and jobs.

Academic Plans

Four-Year Graduation Plan

The following checkpoints list the minimum requirements students must complete by certain semesters in order to stay on the University's Four-Year Graduation Plan. Courses in the major are those required to complete the major; they may be offered by departments other than the major department.

Many mathematics courses must be taken in sequence, so students must begin major requirements as early as possible, and individual plans of study must be constructed carefully. The major typically requires 13 or 14 courses. Students must choose Program A, B, or C by the end of the third semester and must remain in their chosen program until they graduate in order to stay on track for the four-year graduation plan.

Before the third semester begins: coursework in the major through second-semester calculus.

Before the fifth semester begins: three or four more courses in the major.

Before the seventh semester begins: three or four more courses in the major and at least 90 s.h. earned toward the degree.

Before the eighth semester begins: two or three more courses in the major.

During the eighth semester: enrollment in all remaining coursework in the major, all remaining GE CLAS Core courses, and a sufficient number of semester hours to graduate.

Sample Plans of Study

Sample plans represent one way to complete a program of study. Actual course selection and sequence will vary and should be discussed with an academic advisor. For additional sample plans, see MyUI.

Mathematics, BS

- Program A [p. 4]
- Program B [p. 5]

Program A

Course	Title	Hours
Academic Career		
Any Semester		
Program A is primarily for students who plan to work in business or government or to pursue graduate study in mathematics.		

Students must earn at least 15 s.h. in post-calculus mathematics courses offered by the Department of Mathematics or cross-referenced with a mathematics course at the University of Iowa. Post-calculus courses are numbered 2000 or above, excluding: MATH:3700 Introduction to Matrix Theory, MATH:3750 Classical Analysis, MATH:3995 Topics in Mathematics, MATH:3996 Individual Study & Honors in Mathematics, MATH:3997 Readings in Mathematics, MATH:4010 Basic Analysis, and MATH:4020 Basic Abstract Algebra. [a]

GE CLAS Core: Sustainability [b]		
Hours		**0**
First Year		
Fall		
MATH:1850	Calculus I [c]	4
RHET:1030 or ENGL:1200	Rhetoric or The Interpretation of Literature	3 - 4
GE CLAS Core: Values and Culture [d]		3
CSI:1600	Success at Iowa	2
Elective course [e]		2
Hours		**14-15**
Spring		
MATH:1860	Calculus II	4
MATH:2700	Introduction to Linear Algebra	4
RHET:1030 or ENGL:1200	Rhetoric or The Interpretation of Literature	3 - 4
GE CLAS Core: Diversity and Inclusion [d]		3
Elective course [e]		1
Hours		**15-16**
Second Year		
Fall		
MATH:2850	Calculus III	4
MATH:3600	Introduction to Ordinary Differential Equations	3
GE CLAS Core: Social Sciences [d]		3
GE CLAS Core: World Languages First Level Proficiency or elective course [f]		4 - 5
Elective course [e]		2
Hours		**16-17**
Spring		
MATH:3720	Introduction to Abstract Algebra I	4
Major: required post-calculus math elective course [g]		3
GE CLAS Core: Historical Perspectives [d]		3
GE CLAS Core: World Languages Second Level Proficiency or elective course [f]		4 - 5
Elective course [e]		2
Hours		**16-17**
Third Year		
Fall		
MATH:3770	Fundamental Properties of Spaces and Functions I	4
Major: required post-calculus math elective course [g]		3 - 4
GE CLAS Core: Natural Sciences with Lab [d]		4
GE CLAS Core: World Languages Third Level Proficiency or elective course [f]		4 - 5
Hours		**15-17**

Spring

Major: required post-calculus math elective course [g]	3 - 4
Major: required upper-level math elective course [h]	3
GE CLAS Core: Natural Sciences without Lab [d]	3
GE CLAS Core: World Languages Fourth Level Proficiency or elective course [f]	4 - 5
Elective course [e]	3
Hours	**16-18**

Fourth Year

Fall

Major: required upper-level math elective course [h]	3
GE CLAS Core: International and Global Issues [d]	3
GE CLAS Core: Literary, Visual, and Performing Arts [d]	3
Elective course [e]	3
Elective course [e]	3
Hours	**15**

Spring

Major: required upper-level math elective course [h]	3
Elective course [e]	3
Elective course [e]	3
Elective course [e]	3
Elective course [e]	3
Degree Application: apply on MyUI before deadline (typically in February for spring, September for fall) [i]	
Hours	**15**
Total Hours	**122-130**

a See General Catalog or consult an advisor for more information.

b Sustainability must be completed by choosing a course that has been approved for Sustainability AND for one of these General Education areas: Natural Sciences; Quantitative and Formal Reasoning; Social Sciences; Historical Perspectives; International and Global Issues; Literary, Visual, and Performing Arts; or Values and Culture.

c Enrollment in math courses requires completion of a placement exam.

d GE CLAS Core courses may be completed in any order unless used as a prerequisite for another course. Students should consult with an advisor about the best sequencing of courses.

e Students may use elective courses to earn credit towards the total s.h. required for graduation or to complete a double major, minors, or certificates.

f Students who have completed four years of a single language in high school have satisfied the GE CLAS Core World Languages requirement. Enrollment in world languages courses requires a placement exam, unless enrolling in a first-semester-level course.

g At least four of the six major electives must have a prefix of MATH, including at least three upper-level math courses. See General Catalog or consult an advisor for more information about appropriate elective courses.

h Mathematical electives must include at least three upper-level math courses. These include: MATH:3900 and math courses (MATH prefix) numbered 4000 and higher, but not MATH:4010, MATH:4020 and MATH:4120. Each upper-level math course is offered at most once per year; choose when to complete the upper-level requirement according to spring or fall offerings for desired courses.

i Please see Academic Calendar, Office of the Registrar website for current degree application deadlines. Students should apply for a degree for the session in which all requirements will be met. For any questions on appropriate timing, contact your academic advisor or Graduation Services.

Program B

This sample plan is currently being updated and will be added at a later date.