

PROGRAM C, B.A./B.S.: MATHEMATICS + SPECIALIZATION

Program C allows students to earn a Mathematics degree (B.A. or B.S.) by combining courses in the Department of Mathematics with courses from one other department, unless specified by the template. In most areas of specializations, mathematical and/or quantitative courses in other departments are part of the math degree program. All Program C students take a minimum of five core math courses: Calculus I, Calculus II, Calculus III, Introduction to Linear Algebra, and a proofs course, usually either Introduction to Abstract Algebra or Fundamental Properties of Spaces and Functions I.

As of Fall 2021, the pre-approved areas of specialization are as follows: Biochemistry, Biomathematics, Biostatistics, Chemistry, Computer Science, Data Science, Economics, Engineering (each department), Finance, Optimal Business Decision-Making, Physics, Risk Management/Insurance, Statistics and Actuarial Science. All areas of specialization include electives in their plans of study. Some of the specializations have required courses in addition to the five-course mathematics core.

Every student in Program C must file a plan of study before the start of the senior year. In consultation with a mathematics advisor, a student prepares a proposed list of courses. The plan (with the advisor's endorsement) is then forwarded to the Department's Director of Undergraduate Studies for approval. If the proposal follows one of the pre-approved established templates, then approval is automatic. If a student and advisor select courses that vary from the established templates or constitute a new area of specialization, the proposed plan of study must receive the approval of the Director of the Undergraduate Program and/or the Mathematics Department Undergraduate Committee. The plans for B.A. courses usually have 11-12 courses, and the plans for B.S. courses usually have 13-14 courses (depending on the specialization). These numbers may change if Engineering Math courses are used.

All Program C course plans must fulfill the following four requirements.

- 1) **Each elective satisfying a course requirement must be at least 3 semester hours.** Combining lower semester-hour courses to satisfy one course requirement is not allowed.
- 2) **Every math major must take at least one upper-level math course for BA, and at least two upper-level math courses for B.S.** Upper-level Math courses are MATH:3900 or courses numbered 4000 or higher but excluding MATH:4010, 4020, and 4120
 - a) **B.A.:** All students declared a math major in Fall 2012 and after must take at least **one upper-level math course for B.A.**
 - b) **B.S.:** All students declared a math major in Fall 2016 and after must take at least **two upper-level math courses for B.S. in Program C.** The students declared a math major in Fall 2012 and after, but before Fall 2016 must take at least **one upper-level math course for B.S.**
- 3) **Every subtrack has a list of approved electives.** If an area of specialization requires additional courses beyond the five core Mathematics courses, these additional courses are counted toward the electives. At least three of the approved electives that students can select must be in the mathematical sciences (Mathematics, Statistics and Actuarial Science, and Computer Science) **(MCS)** with the following restrictions.
 - a) **B.A.:** At least two of these three MCS courses must have MATH prefix and must be post-calculus.
 - b) **B.S.:** All students declared a math major in Fall 2016 and after must take at least **three post-calculus MATH courses including two upper-level MATH courses for B.S.** All B.S. students declared a math major before Fall 2016 are allowed to use the option (a).
- 4) **Students majoring in mathematics must satisfy the department's residency requirement.** Every math major must earn at least 15 semester hours at UI in post-calculus courses offered in Mathematical Sciences, and at least 12 s.h. of them must be offered by (or be cross-listed with) the

Mathematics Department. The post-calculus courses in Mathematics (**PC**) are those with numbers higher than 2000 excluding MATH:3700, 3750, 3995-3997, 4010, and 4020. Acceptable post-calculus Computer Science and Statistics courses must have a calculus prerequisite. No transfer courses or credit by examination will be accepted for the post-calculus course residency requirement.

Core Mathematics Courses for Program C

Calculus I and Calculus II 8 s.h.

Either of the sequences MATH:1550-1560 or MATH:1850-1860, is acceptable. The sequences are distinct enough that the Department does not encourage students to switch from one version of Calculus I to a different version of Calculus II unless there is a strong need and good preparation. Advanced placement credit, CLEP credit, and credit obtained through the Mathematics Incentive Program is accepted for all or part of the calculus requirement.

MATH:2700 Introduction to Linear Algebra 4 s.h.

MATH:2850 Calculus III 4 s.h.

Either of MATH:3720 Introduction to Abstract Algebra I 4 s.h.
or MATH:3770 Fundamental Properties of Spaces and Functions I

Higher level courses may be substituted for core courses if approved by the Mathematics Department Director of Undergraduate Studies.

List of Mathematical Sciences Courses for Program C

1. Mathematics courses MATH: 3600 or higher, but excluding 3700, 3750, 3995-3997, 4010, 4020, and 4120. Independent study, reading, topics, seminar, project courses are not allowed unless approved by the Math Department in advance.

2. Computer Science courses CS:1210 through CS:4740, excluding CS:2111, 3210, 3910, 3980, 3990. The independent study, reading, topics, seminar, and project courses are excluded unless approved by the Mathematics Department in advance.

List: CS: 1210, 2110, 2210, 2230, 2420, 2520, 2620, 2630, 2820, 3330, 3620, 3640, 3820, 4330, 4340, 4350, 4640, and advanced electives: between 3620-4740 except 3910, 3980, and 3990.

3. Statistics and Actuarial Science courses that count toward an undergraduate major in Statistics or Actuarial Science, excluding independent study, reading, topics, seminar, project, exam preparation courses unless approved by the Math Department in advance.

List: Only one of STAT:2020 or 3100 or 3120

(only one of these can be counted, and only if taken before STAT:4100).

Additional accepted courses are:

STAT: 2010, 3101, 3200, 3210, 3620, 4100, 4101, 4510, 4520, 4740, 5100, 5101, 5120

ACTS: 3080, 3085, 4130, 4180, 4230, 4280, 4380

Program C Specialization: Biomathematics BS (2021)

Mathematics plays an essential role in studying biological systems and advancing medicine. Mathematical models of biological systems allow testing assumptions that may not be accessible experimentally and generate innovative predictions that can lead to future research. The Department of Mathematics at the University of Iowa has outstanding faculty with a strong teaching and research record in Mathematical Biology.

The program in Mathematical Biology will help students to think about biological systems mathematically. Students will obtain essential skills in mathematical analysis and simulation and mathematical modeling in biology and knowledge of particular biology areas. This program will qualify students to participate in undergraduate research and use quantitative techniques in biology, neuroscience, and other fields.

BS program requires 6 (7 if option A.2 is used) core courses in Mathematics plus at least 7 electives in Mathematics, Biological Sciences and Statistics. All Program C degree requirements on upper-level math courses, Mathematical Sciences courses, math residency, and 3-4 sh electives apply (see pages 1, 2). **A Program C Plan of Study must be filed with the Department of Mathematics before the start of the senior year. All changes in your Plan of Study must be approved by the Director of Undergraduate Program.**

A. Mathematical core courses (23 s.h):

Option 1: Standard math sequence (23 s.h)

MATH 1850 Calculus I
 MATH 1860 Calculus II
 MATH 2700 Introduction to Linear Algebra
 MATH 2850 Calculus III
 MATH 3600 Intro to Differential Equations
 MATH 3770 Fundamental Properties of Spaces & Functions I

Option 2: Engineering math sequence (20 s.h + 3 s.h = 23 s.h)

MATH 1550 Engineering Math I
 MATH 1560 Engineering Math II
 MATH 2550 Engineering Math III
 MATH 2560 Engineering Math IV
 MATH 3550 Engineering Math V
 MATH 3770 Fundamental Properties of Spaces & Functions I

A 3 s.h post-calculus MATH course different from all of the other courses in the plan.

(not from: 1850/1550, 1860/1560, 3600/2560, 2700/2550, 2850/3550, 3770, 4750, 4060, 3800)

B. Mathematical modeling courses (6 s.h):

MATH 4060 Discrete Mathematical Models
 MATH 4750 Intro to Mathematical Biology

C. Data and computational courses (6 s.h):

MATH 3800 Elementary Numerical Analysis
 STAT 3120 Probability and Statistics

D. Two elective biology courses (6 s.h): At least one course must be at the 3000 level or higher.

See Page 5.

E. One more elective course (3 s.h): (Choose one of the following options)

- A CS course of level 2000 or higher (e.g., CS 2230)
- Another biology course of level 3000 or higher (List on Page 5)
- Another MATH course of level 3000 or higher (e.g., MATH 4820, 4210, 5750, 5760)

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BS program requires 6 (7 if option A.2 is used) core courses in Mathematics plus at least 5 electives in Mathematics, Biological Sciences and Statistics. All Program C degree requirements on upper-level math courses, Mathematical Sciences courses, math residency, and 3-4 sh electives apply (see pages 1, 2). **A Program C Plan of Study must be filed with the Department of Mathematics before the start of the senior year. All changes in your Plan of Study must be approved by the Director of Undergraduate Program.**

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 MATH 2560 Engineering Math IV
 MATH 3550 Engineering Math V
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 (not from: 1850/1550, 1860/1560, 3600/2560, 2700/2550, 2850/3550, 3770, 4750, 3800)

B. Mathematical modeling courses (3 s.h): MATH 4750 Intro to Mathematical Biology

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 STAT 3120 Probability and Statistics

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At least one course must be at the 3000 level or higher. See Page 5.

Biology Electives

BIOL 2512 Fundamental Genetics

You can only choose one of the following two courses:

BIOL 3172 Evolution
or BIOL 3373 Human Population Genetics & Variation

BIOL 3233 Intro Developmental Biology
BIOL 3314 Genomics
BIOL 3343 Animal Physiology
BIOL 3713 Molecular Genetics

You can only choose one of the following two courses:

BIOL 2753 Intro to Neurobiology
or PSY 2701 Introduction to Behavioral Neuroscience

BIOL 3253 Neurobiology I
BIOL 3254 Neurobiology II

CHEM 2210 Organic Chemistry I
BIOC 3120 Biochemistry and Molecular Biology I
BIOC 3130 Biochemistry and Molecular Biology II
BIOC 4241 Biophysical Chemistry I
BIOC 4242 Biophysical Chemistry II

You can only choose one of the following four courses:

BIOL 4213 Bioinformatics
or BIOL 4386 Introduction to Scientific Computing
or BIOC 3310 Practical Data Science and Bioinformatics
or BIOC/BME 4310 Computational Biochemistry

BIOL 2673 Ecology
BME 2500 Biomaterials & Biomechanics