

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).

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 upperlevel 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 postcalculus 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 postcalculus 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: Data Science (2019)

This program requires 5 core courses in Mathematics plus at least 6 (B.A.) or 8 (B.S.) electives in Mathematics, Computer Science 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). For the Data Science subtrack, all courses in the plan must have MATH or CS or STAT prefix. A Program C Plan of Study must be filed with the Department of Mathematics before the start of the senior year.

Required 5 Core Math Courses

_____ MATH:1850 Calculus I

_____ MATH:1860 Calculus II

_____ MATH:2700 Introduction to Linear Algebra

_____ MATH:2850 Calculus III

_____ MATH:3720 Introduction to Abstract Algebra OR

MATH:3770 Fundamental Properties of Spaces & Functions I

For any of the above core courses, higher-level Mathematics courses or Engineering math courses may be substituted, if they are approved by the Director of the Undergraduate Program.

Elective Courses

Only one of MATH:3720 and MATH:3770 can be counted as an elective if both are taken.

B.A. requires 6 electives. Choose 2 electives from each of the Group I, Group IIc and IIs. The plan must have at least 2 post-calculus courses with MATH prefix beyond the 5 core math courses, ***and must have at least 1 upper-level MATH course (U).***

B.S. requires 8 electives. Select at least 3 electives from Group I. Select 5 electives from Groups IIc and IIs, with at least two in each. The plan must have at least 3 post-calculus courses with MATH prefix beyond the 5 core math courses, ***and must have at least 2 upper-level MATH courses (U).***

Group I: Math

_____ (PC) MATH:3600 Introduction to Ordinary Differential Equations

_____ (PC) MATH:3720 Introduction to Abstract Algebra

_____ (PC) MATH:3770 Fundamental Properties of Spaces & Functions I

_____ (PC) MATH:3800 Elementary Numerical Analysis

- _____ (U) Upper-level MATH course(s): MATH:3900 or numbered 4000 or higher but excluding MATH:4010, 4020, and 4120. Recommended:
- _____ (U) MATH:4050 Intro Discrete Math (Fall)
- _____ (U) MATH:4060 Discrete Math Models (Spring)
- _____ (U) MATH:4820 Optimization Techniques (Spring)
- _____ (U) MATH:5800-5810 Numerical Methods (Fall-Spring)

For both B.A. and B.S.: There can be at most one course below 3000 level from each of Group IIc and IIs electives.

Group IIc: Computer Science List

CS: 1210, 2210, 2230, 3330, 4400, 4440, 4470, 5430, 5630

Group IIs: Statistics List

STAT: 2010, 3100, 3101, 3200, 3210, 4520, 4540, 4560, 4580, 5810