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. 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 Spring 2014, the pre-approved areas of specialization are as follows: Biomathematics, Biostatistics, Chemistry, Computer 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 *(courses numbered 22M:096 or 22M:113 or higher excluding 22M:196-199)*.
   a) **B.A.:** All students who 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 who 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 who 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 (22M) prefix, and must be post-calculus.
   b) **B.S.:** All students who 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 who declared a math major before Fall 2016 are allowed to use the option (3a) regarding the number of the MATH electives**.**

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 *(courses with numbers 22M:27 or higher excluding 22M:31, 32, 81, 104, 105, 109, 110 and 196-199)*. 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 *(22M:031-032, 8 s.h.)* or MATH:1850-1860 *(22M:025-026, 8-10 s.h.)* 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 *(22M:027)* Introduction to Linear Algebra 4 s.h.

MATH:2850 *(22M:028)* Calculus III 4 s.h.

Either of MATH:3720 *(22M:050)* Introduction to Abstract Algebra I 4 s.h.
or MATH:3770 *(22M:055)* 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 *(22M:72 or higher excluding 22M: 081, 095, 104, 105, 107, 109, 110, 196-199)*. Independent study, reading, topics, seminar, project courses are not allowed unless approved by the Math Department in advance.

2. Computer Science courses CS:1210 *(22C:016)* 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.
(22C:16, 19, 21, 22, 31, 60, 80, 82, 84, 86, 111, 112, 118, 131, 135, 169, 188, and advanced electives)

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 *(22S:39 or 120 or 130)* (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
(22S:30, 131, 133, 138, 150, 152, 153, 154, 158, 169, 174, 175, 179, 180, 181, 182, 183, 190, 193, 194)

Program C Specialization: Biomathematics (2016)

This program requires 7 courses in Mathematics plus 4 (B.A.) or 6 (B.S.) electives in Mathematics and Biology. 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 before the start of the senior year.

Required 5 Core Math Courses

_____ MATH:1850 *(22M:025)* Calculus I or MATH:1550 *(22M:031)* Engineering Math I
_____ MATH:1860 *(22M:026)* Calculus II or MATH:1560 *(22M:032)* Engineering Math II
_____ MATH:2700 *(22M:027)* Introduction to Linear Algebra
_____ MATH:2850 *(22M:028)* Calculus III
_____ MATH:3770 *(22M:055)* 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.

Additional Required Courses

_____ (PC) MATH:3600 *(22M:100)* Introduction to Differential Equations
_____ (U) MATH:4610 *(22M:140)* Continuous Mathematical Models

Elective Courses

*The **B.A.** requires 4 electives. Select at least 1 elective from Group I, at least 2 electives from Group II, and all from Groups I, II, and III.* ***The plan must include at least 1 (U) upper-level MATH course (such as MATH 4610) and more is recommended.***

*The **B.S.** requires 6 electives. Select at least 1 elective from Group I, at least 2 electives from Group II, and all from Groups I, II, and III.* ***There must be at least 3 post-calculus courses in the plan with MATH prefix beyond the 5 core math courses. The plan must include at least 2 (U) upper-level MATH courses (such as MATH 4610, 4060) and more is recommended.***

Group I: _____ (PC) MATH:3800 *(22M:072)* Elementary Numerical Analysis
_____ (MCS) STAT:3120 *(22S:120)* Probability and Statistics

Group II: At least two 2000 or higher-level courses <u>in one area of biology</u>, such as ecology and evolutionary biology, genetics, molecular and cellular biology, developmental biology, physiology, pharmacokinetics, neurobiology, immunology, biochemistry epidemiology, microbiology, or biomedical engineering

_____ BIOL: 2000 or higher-level course from this list
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Group III:
_____ (U) MATH:4060 *(22M:151)* Discrete Mathematical Models
_____ (U) MATH:4820 *(22M:174)* Optimization Techniques
_____ (U) MATH:5600 *(22M:142)* Nonlinear Dynamics with Numerical Methods
_____ (U) MATH:5700 *(22M:144)* Partial Diff. Equations w. Numerical Methods
_____ (U) MATH:5800 *(22M:170)* Num. Analysis: Nonlinear Equations
_____ (U) MATH:5810 *(22M:171)* Num. Analysis: Differential Equations
_____ (MCS) CS:1210 *(22C:016)* Computer Science I: Fundamentals
_____ BIOL: 2000 or higher-level course in any area of biology