PROGRAM C, BA/BS: 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 electives and 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 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 subtrack has a list of approved electives. (MCS) At least three of the approved electives that students can select must be in the mathematical sciences (Mathematics, Statistics and Actuarial Science, Computer Science), though not every course from these departments has been approved. See the list below. At least two of these three courses must have MATH (22M) prefix, and must be post-calculus. If an area of specialization requires additional courses beyond the five core Mathematics courses, these additional courses are counted toward the electives.

3. Every math major must take at least one upper-level MATH course. (U) 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)*.

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 requirement.

Core Mathematics Courses for Program C

Calculus I and Calculus II 8-10 s.h.

(starting in Spring 2014, all MATH Calculus I and II courses will each be 4 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.

MATH:3720 *(22M:050)* Introduction to Abstract Algebra I
OR 4 s.h.
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)* or higher that count toward an undergraduate major in Computer Science, excluding independent study, reading, topics, seminar, project courses unless approved by the Math 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 3620-4990 except 3910, 3980, 3990, and 4980.
(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 <u>one</u> 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: Physics

This program requires 5 core courses in Mathematics plus at least 6 (B.A.) or 8 (B.S.) electives in Mathematics and Physics. 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 Physics subtrack, all courses in the plan must have MATH or PHYS or ASTR (22M or 029) prefix. At least 3 of the electives must have MATH (22M) prefix and must be post-calculus (PC); and at least one must be an upper level math course (U). Every upper level math course is post-calculus, and every post-calculus course is in mathematical sciences. A Program C Plan of Study must be filed before the start of the senior year.

Required Core 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 **OR**
MATH:3720 *(22M:050)* Introduction to Abstract Algebra

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

Select at least 6 electives (for B.A.) and select at least 8 electives (for B.S.), all from Groups I and II, satisfying the following:

- ***At least 3 electives from Group I, 2 of which must be in physics, and***
- ***At least 3 electives must be in MATH (22M), including at least 1 MATH upper-level course (U), and more is recommended***

One of MATH:3720 or 3770 can be counted as an elective if both are taken.

Group I: requires three or more courses with at least two in physics

_____ PHYS:3710 *(029:115)* Intermediate Mechanics
_____ PHYS:3730 *(029:118)* Statistical Physics
_____ PHYS:3811 *(029:129)* Electricity and Magnetism I
_____ PHYS:3812 *(029:130)* Electricity and Magnetism II
_____ PHYS:3741 *(029:140)* Introduction to Quantum Mechanics I
_____ PHYS:3742 *(029:141)* Introduction to Quantum Mechanics II
_____ (PC) MATH:3600 *(22M:100)* Introduction to Ordinary Differential Equations
_____ (U) MATH:4200 *(22M:118)* Complex Variables

Group II:

_____ (U) MATH:4210 *(22M:113)* Foundations of Analysis
_____ (U) MATH:5200 *(22M:115)* Introduction to Analysis I
_____ (U) MATH:5210 *(22M:116)* Introduction to Analysis II
_____ (U) MATH:5800 *(22M:170)* Num. Analysis: Nonlinear Equations
_____ (U) MATH:5810 *(22M:171)* Num. Analysis: Differential Equations
_____ (U) MATH:5600 *(22M:142)* Nonlinear Dynamics with Numerical Methods
_____ (U) MATH:5700 *(22M:144)* Partial Diff. Equations w. Numerical Methods
_____ PHYS or ASTR (029) course numbered 3000 or higher that count toward an undergraduate major in Physics or Astronomy, excluding independent study, reading, topics, seminar, and project courses unless approved by the Math Department in advance.