

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 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: Engineering (each department)

(B.A.) program requires 5 core courses and 3 electives in Mathematics, plus at least 4 electives from one Engineering Department. For (B.S.), 2 more electives in Mathematics or Engineering are required beyond the (B.A.) program. 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.

Students majoring in the College of Engineering need to be aware that a mathematics degree in the College of Liberal Arts and Sciences requires different General Education courses, including the completion (or equivalent competency) of four semesters of one foreign language.

Required Core Courses

Option 1: Engineering sequence (16 sh)

- _____ MATH:1550 (22M:031) Engineering Math I
- _____ MATH:1560 (22M:032) Engineering Math II
- _____ MATH:2550 (22M:033) Engineering Math II
- _____ MATH:2560 (22M:034) Engineering Math IV
- _____ MATH:3550 (22M:037) Engineering Math V

Option 2: Standard math sequence (16 sh)

- _____ MATH:1850 (22M:025) Calculus I
- _____ MATH:1860 (22M:026) Calculus II
- _____ MATH:2700 (22M:027) Introduction to Linear Algebra
- _____ MATH:2850 (22M:028) Calculus III

Option 1 and 2 courses may be combined according to Mathematics Department rules.

Please discuss this with the Director of Undergraduate Program in Mathematics.

Additional at least 3 MATH Courses

- _____ MATH:3720 (22M:050) Introduction to Abstract Algebra **OR**
- _____ MATH:3770 (22M:055) Fundamental Properties of Spaces & Functions I
- _____ Post-calculus MATH course beyond the core 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).
- *Only one of MATH:2560 and 3600 (22M:034 and 100) counts if both are taken.
- _____ (U) **Upper-level MATH course(s): (1 required, and more than 1 is recommended.)**
- _____ MATH:3900 or numbered 4000 or higher but excluding MATH:4010, 4020, and 4120 (22M:096 or 22M:113 or higher excluding 22M:196-199).

Every upper level MATH course, MATH 3720, and 3770 are post-calculus courses. One of MATH:3720 or 3770 can be counted as a post-calculus elective if both are taken. Each course can satisfy only one of these requirements, and one needs 3 different courses to satisfy these requirements.

Engineering Elective Courses

For (B.A.), at least 4 junior- or senior-level Engineering courses are required, all from the same Engineering Department of the student's choice. For (B.S.), 6 electives are required, at least 4 electives must be from Engineering (as specified as in B.A.), and the additional 2 electives can be in Mathematics or in Engineering or one in each. Please go to the next pages for the current lists. Proposals containing Engineering courses beyond these tentative lists must be discussed with DUS.

Electives for ENGINEERING in PROGRAM C in MATH

Biomedical Engineering

051:182	BME:5200	Biomedical Signal Processing
051:185	BME:5210	Medical Imaging Physics
051:148	BME:5220	Digital Imaging Processing
051:186	BME:5230	Multidimensional Image Processing
051:141	BME:5251	Advanced Biosystems
051:170	BME:5401	Biomaterials & Implant Design
051:167	BME:5430	Biotransport
051:154	BME:5510	Cardiac and Vascular Mechanics
051:155	BME:5520	Cardiovascular Fluid Mechanics
051:150	BME:5610	Musculoskeletal Biomechanics

Chemical & Biochemical Engineering

The lists of electives for this department are not finalized yet. Electives are determined in consultation with the Director of the Undergraduate Program in Mathematics (DUS).

Civil & Environmental Engineering

053:136	CEE:3136	Design of Concrete Structures
053:055	CEE:3155	Principles of Environmental Engineering
053:071	CEE:3371	Principles of Hydraulics and Hydrology
053:030	CEE:3530	Soil Mechanics
053:033	CEE:3533	Principles of Structural Engineering
053:086	CEE:3586	Civil Engineering Materials
053:063	CEE:3763	Principles of Transportation
053:157	CEE:4157	Environmental Engineering Design
053:071	CEE:4370	Flow in Open Channels
053:174	CEE:4374	Water Resource Design
053:112	CEE:4512	Engineering Design Optimization
053:133	CEE:4533	Finite Element I
053:134	CEE:4535	Design of Steel Structures
053:162	CEE:4762	Design of Transportation Systems
053:163	CEE:4763	Traffic engineering
	CEE:5000	Level Courses (subject to approval by the Math Department)
		The following are already approved:
053:169	CEE:5369	Intermediate fluid mechanics
053:140	CEE:5540	Intermediate mechanics of deformable bodies

Electrical & Computer Engineering

055:032	ECE:3320 Intro to Digital Design
055:033	ECE:3330 Introduction to Software Design
055:035	ECE:3350 Computer Architecture and Organization
055:036	ECE:3360 Embedded Systems and Systems Software
055:043	ECE:3400 Linear Systems II
055:041	ECE:3410 Electronic Circuits
055:050	ECE:3500 Communication Systems
055:060	ECE:3600 Control Systems
055:070	ECE:3700 Electromagnetic Theory
055:072	ECE:3720 EE Materials and Devices
	ECE:5000 level courses (subject to approval by the Math Department)
	The following are already approved:
055:130	ECE:5300 Switching Theory
055:133	ECE:5330 Graph algorithms and combinatorial optimization
055:146	ECE:5460 Digital signal processing
055:152	ECE:5520 Intro Information & coding theory
055:150	ECE:5500 Communication theory
055:160	ECE:5600 Control theory
055:170	ECE:5700 Advanced electromagnetics

Mechanical and Industrial Engineering

058:40	ME:3040 Thermodynamics II
058:45	ME 3045 Heat Transfer
058:52	ME 3052 Mechanical Systems
058:48	ME 4048 Energy System Design
058:55	ME 4055 Mech System Design
	ME 4000/5000 level courses (subject to approval by the Math Department)
	The following are already approved:
058:112	ME:4112 Engineering Design Optimization
058:115	ME:4115 Finite element I
058:154	ME:5154 Intermediate kinetics & dynamics
058:160	ME:5160 Intermediate fluid mechanics
056:131	IE:3300 Manufacturing Systems
056:134	IE:3350 Process Engineering
056:144	IE:3400 Human Factors
056:147	IE:3450 Ergonomics
056:150	IE:3500 Information Systems Design
056:162	IE:3600 Quality Control
056:166	IE:3610 Stochastic Modeling
056:171	IE:3700 Operations Research
056:178	IE:3750 Digital Systems Simulation
056:176	IE:3760 Applied Linear Regression (Cross listed 22S:152)
056:172	IE:4172 Big Data Analytics
	IE: 5000 Level courses (subject to approval by the Math Department)