Actuarial Science at the University of Minnesota

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This document contains a summary of the University's Actuarial Programs, including a brief statement of requirements for an undergraduate degree in any of three colleges, and for one graduate degree. It is intended to be collegially neutral. It is not intended as an introduction to, or an advertisement for, the actuarial profession. Brochures with those objectives are available from the Society of Actuaries or the Casualty Actuary Society.

Contents

1. General Information.

University Structure: Colleges and Degrees. The University of Minnesota is divided into a number of major subunits or "colleges", three of which are referenced below: the College of Science & Engineering (CSE); the College of Liberal Arts (CLA); the Curtis L. Carlson School of Management (CSOM) also known as the Business School.

The Actuarial Program is cross-collegiate and cooperative, spelling out a core of coursework which has been developed in consultation with practicing actuaries, and which is designed to give the student the best possible undergraduate foundation for a career as an actuary. Because the colleges set their own graduation requirements and award different degrees (BS, BA, or BSB), the requirements for a major (or specialization) in Actuarial Science vary according to the college as will be described below.

Major Departments. The Actuarial Program has historical roots going back to 1983 in the School of Mathematics, and official recognition of "Actuarial Specialization" by transcript notation is possible in the case of a major in Mathematics (CSE or CLA). Since 1996, the Business School (CSOM) has offered a major known as "Actuarial Science". However, Fall 2008 was the last time this major was made available to new students. CSOM has discontinued both the Actuarial Major and Minor.

The actuarial "core", which will be explained below, obligates the student to an average of one intensively mathematical course per semester (9 in all). The actuarial core also includes five courses which are required of any business major. Not surprisingly, a business major will be subject to several additional business course requirements, whereas a mathematics major will be subject to departmental requirements of about five additional math courses. There is each year only one course in Actuarial Mathematics, and in this course the students of all colleges are comingled.

Core requirements of the program can also be completed within the framework of a major in any of several other departments, among them Economics (CSE or CLA), Statistics (CSE or CLA), and Insurance/Risk Management (CSOM). Within any one college, a combination or "double" major is a relatively simple thing.

Mathematics or Business? There is no evidence that one college or department has an advantage over another with respect to employability as an actuary, and for that reason we recommend that the student follow his/her own preferences, weighing primarily the non-actuarial aspects of the proposed college. A cross-college "double major" is possible in principle, but the combined graduation requirements of two separate colleges would probably involve the student in more time and more credits than are worthwhile.

Related Minors from CSOM (Business School).

All undergraduates at the University of Minnesota are subject to liberal education requirements known as "diversified cores" and "designated themes". The marginal impositions of these "CLE" requirements upon a student's program appear to be the same for business or math, and need not be a factor. Nor will we attempt to spell them out in complete detail in this document.

However, associated to the Math major are some possibly hidden requirements which could be significant: any student in CLA is required to demonstrate a foreign language proficiency, whereas any math major in CSE is required to take three semesters of physics. The foreign language is not required in CSE, and physics is not required for the Math major in CLA. Thus, if a choice is made to major in math, then the second choice (CLA or CSE) is in essence a choice between foreign language and physics.

Minors. The Actuarial Core includes enough mathematics for a Math minor. As of Fall 2008, CSOM offers two Minors to the Math Major with an Actuarial Science specialization:
1) Management Minor: free-standing Minor available to all Majors in all Colleges (16 cr.)
2) Risk Management and Insurance Minor: available only to Actuarial Math Majors (12 cr.).

Either business minor requires two or more business-related courses plus at least two elective courses which are already in the actuarial core. Thus the student needs only one or two additional business courses, all of which are clearly valuable to the future actuary. This marginal coursework is easily incorporated into a standard Math major. The Actuarial Core may leave the student only two courses short of a Statistics minor when Stat 5101-5102 are chosen for the core's Probability/ Statistics requirement.

2. The Undergraduate Actuarial Core. (**not included in CSOM core/Actuarial Major)

These are the requirements which are common in all three colleges to the Actuarial Program.

1. Mathematics lower division: 1271-1272-2243-2263 or 1371-1372-2373-2374.
Comment: This amounts to two years of one- and multi-variable calculus, including some linear algebra and differential equations. Credits from other institutions are generally acceptable as substitutes.

2. Computer Science**: One course in elementary programming, such as 1103 (Java) or 1113 (Programming in C/C++).

3. Economics: Elementary Macro (1102 or 1105), Intermediate Micro (3101)** and Financial Economics (Econ 4751 or Fina 4241)**
Comment: Intermediate Micro has a prerequisite of Elementary Micro (1101 or 1104)

4. Business: Acct 2050; Fina 3001; Ins 4100 and/or 4101 and/or 4200 (2 of 3)

5. Probability/Statistics: Either Stat 5101-5102 or Math 5651-5652 or Stat 4101-4102.
Comment: These are calculus-based sequences. The first two are preferred, but the last is somewhat easier and may be appropriate for some students. However, for a math major there may be significant adverse consequences associated to the election of Stat 4101-4102, which should not be done unless prior consultation with an advisor.

6. Actuarial Mathematics: Math 4065-5067-5068.
Comment: Math 4065 is the Theory of Interest. The next two are the core-of-the-core, Actuarial Mathematics I-II. The prerequisites for Math 5067 are Math 4065 and the first Statistics course.

3. Additional Requirements for Graduation

The following requirements are spelled out more explicitly and contractually in the bulletins of the respective colleges. We include summaries here for the convenience of the student. We emphasize once again that we are not stating the so-called CLE requirements, which can be expected to consume about 36 credits. Some of these requirements, especially including the diversified core "Mathematical Thinking" are automatically covered. Consultation with a college adviser is essential.

A. Requirements for the Math Major in CSE.
1) A complete lower division Math program as in the core, plus Math 2283 or 3283.
2) Three semesters of calculus-based physics (usually 1301-1302-2303).

Note: The third semester is waived for students completing the other requirements of the actuarial program.

3) A course in computer science as in the actuarial core.
4) Two courses in analysis (can be Math 5651 and 5652).
5) Two courses in algebra (should include 4242).
6) The so-called "technical elective" (can be Econ 3101 plus Econ 4751).
7) 120 credits and a GPA at least 2.0.

Comment: The total number of upper division technical courses required is 10. The program core together with (4), (5) and (6) above covers 9 of the 10.

If the student for whatever reason chooses to sacrifice the designation "with Actuarial Specialization", this by no means bars him or her from seeking actuarial employment. It may, depending on which core courses are not completed, impose some additional requirements of analysis or technical elective.

B. Requirements for the Math major in CLA.
1) A complete lower division Math program as in the core, plus Math 2283 or 3283.
2) A course in computer science as in the core.
3) Two courses in analysis.
4) Two courses in algebra.
5) A senior project. (4997W; can be oriented to Actuarial Math)

Comment: The total number of upper division math courses required of the pure CLA math major is 6. However, factoring in the core Probability/Statistics/Economics/Actuarial requirements raises the number of technical courses to an effective 9 (or 8 if Fina 4241 is chosen over Econ 4751).

C. Requirements for the Actuarial Science Major in CSOM (Fall 2008 freshmen).

1) The Actuarial Core as stated above. (less courses noted by **) APEC 1101 &/or 1102H okay for ECON.
2) The Functional Core: Acct 2050 or 2050H & 3001, OMS 2550 & 3001, Fina 3001, Mktg 3001, HRIR 3021, IDSC 3001, Mgmt 3001.
3) The Communication, International, Business Policy Core: Mgmt 3033W/V & 3040(H) & 4004W/V.
4) The Tool Core (additional courses): Psy 1001, BA 3000.
5) The Electives: Ins 4100, 4101, 4200, 4211, 4202 (at least two of the five courses).

Comment: Some of the courses listed above have prerequisites which are not explicitly stated in this document.

4. Other Recommended Courses for Actuarial Science Students

The following list of courses has been prepared with the assistance of our actuarial consultants, but some of them are offered irregularly at best. The number of opportunities to take such additional courses is often quite limited.

[Math 2001 Actuarial Science Seminar – not currently offered]
Math 4428 Mathematical Modeling (Spring only)
Math 5485 Numerical Methods (Fall only)
Math 5705 Combinatorics A
Math 5707 Combinatorics B

Stat 5302 Applied Regression Analysis (Part of SoA course 4)

Fina 4121 Financial Markets and Interest Rates

Econ 3102 Intermediate Macroeconomics
Econ 4113 Introduction to Mathematical Economics (Spring only)

CSci 4061 Introduction to Operating Systems
CSci 5103 Operating Systems (Fall only)

5. Connections to the Actuarial Exams.

University courses and programs are valuable and helpful, but actuarial employers generally view performance on the examinations given by the Society of Actuaries (SoA) as the most reliable measure of competence and commitment. This is particularly true at the entry level, where the so-called “SoA Course 1” exam appears to be an absolute minimum. The student emerges from our program exposed to the topics of SoA Courses 2, 3, 4 but exams 3 or 4 are rarely taken by undergraduates at Minnesota. On the other hand, one of our undergraduates who passes two SoA exams almost automatically rises to the status of "most qualified applicant" for entry-level positions.

It is therefore advisable to take and pass SoA Course 1 early, which is possible for strong students in the spring of the third year. The subject matter is probability.

6. Admission, Advising, Communication, Financial Aid, and the Actuarial Club.

Admission to the University in a degree-seeking undergraduate program is handled by central administration. Application should be made to the student's college of choice, though transfers are common and it is perhaps fair to say that the CLA's admissions standards are the softest of the three.

The University also has wide-ranging options for non degree-seeking persons, available through the Extension Division (College of Continuing Education on the St. Paul Campus: www.cce.umn.edu) with "Non-Enrolled/Non-Degree-Seeking" status. However, a person seeking to reach entry-level proficiency in the actuarial field must realize that the elementary calculus courses cannot be taken concurrently, and a commitment of at least three years is necessary if starting from scratch. Furthermore, few upper division courses are available through Extension (College of Continuing Education – Evening and/or Summer Session Classes).

Advising:

A. Math Majors. During the Summer and between sessions, please contact the Undergraduate Mathematics Office for advising arrangements: ugrad@math.umn.edu <or> 612-625-4848.

Some of the courses in the CSOM are not available to the student body at large, so the Actuarial Specialization must appear on a student's APAS in order to obtain permission to take these classes. For some registration situations, the staff in the Math Office VH 115 can be of assistance.

B. CSOM Majors are referred to Prof. Andrew Whitman (612) 425-4040.

Communication:

The primary vehicle of communication is the Actuarial Bulletin Board, which is located in Vincent Hall outside room 114. Messages of general interest to actuarial students appear from time to time, and the students are advised to check it periodically. Although the program does not operate anything analogous to a "placement service", the messages sometimes include specific job listings.

Each year a few employers of actuaries make recruiting visits to the University. Today's recruiters generally ask first for resumes and schedule interviews accordingly. Therefore the student who hopes to be interviewed must have his/her resume in good shape. The visits, which tend to cluster in late January and February, are coordinated by CSOM Career Services, 190 Hubert H. Humphrey Center (612) 624-0011. Limited assistance with resumes is available, and students from CSE or CLA are welcome. The magic word is "actuarial student".

Financial Aid:

A. Math Majors. The Math Department has a limited amount of scholarship assistance for its majors. These stipends are awarded at the discretion of the Mathematics advisers, with the amount (typically between $100 and $2500) based in part on need. Actuarial students are not treated differently from other math majors. The student need not apply, but will be considered automatically if his/her GPA is above 3.5. Entering freshmen are not eligible.
At the graduate level, a certain number of teaching assistants (TAs) are hired annually by the Math Department. Naturally these are the strongest applicants to the graduate program, and historically have tended to be persons seeking the PhD. However, trends in the 1990s suggest that increasingly many Masters candidates will be seriously considered. Other obvious criteria for selection are the communication skills appropriate to both the classroom and the actuarial workplace. A candidate is advised to notify the coordinator of his/her application.

B. CSOM Majors. A limited number of scholarships and internships are available to CSOM students. Information may be available through CSOM Financial Services (612) 625-0086.

Actuarial Club:

The Actuarial Club was founded in 1991-92 by certain interested and energetic students. This club has the wholehearted support of the Program, and conducts many events which are publicized on the Bulletin Board. The Club actively seeks new members, and the name and phone number of an officer will be provided by the Math Office (VH 115) if it is not on the Bulletin Board. The club has its own website (www.tc.umn.edu/~actuary) and a slightly different style of explaining the program requirements.

Links to Actuarial Science Majors in Respective Colleges

Carlson/CSOM:
http://www.**csom**.umn.edu/Page8439.aspx
http://onestop2.umn.edu/programCatalog/viewCatalogProgram.do?programID=6&strm=1089

CLA:
http://onestop2.umn.edu/programCatalog/viewCatalogProgram.do?programID=141&strm=1089

CSE:
http://onestop2.umn.edu/programCatalog/viewCatalogProgram.do?programID=134&strm=1089

This document prepared by Professors Agard and Whitman, Jan. 1997.
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