Actuarial Science Program
DEPARTMENT OF MATHEMATICS UNIVERSITY OF ILLINOIS
AT URBANA-CHAMPAIGN

Advising Notes for Actuarial Science Majors – Academic Year 2018-2019

This document is designed to help actuarial science (act sci) majors at the University of Illinois at Urbana-Champaign plan their collegiate programs. It will be of particular use to incoming freshmen and sophomores, but students further along in the program may also benefit from reading this material. There will no doubt be student-specific questions and issues which this document does not answer; if so, please feel free to e-mail mathadvising@illinois.edu, and our advisors will do their best to respond promptly (and perhaps even accurately!).

The material below is in five sections:

1) A sample four-year class schedule for an actuarial science major;
2) A listing of courses particularly relevant for the actuarial science (often abbreviated “act sci”) major, including key prerequisites, and recent frequency of course offerings (i.e., whether offered both the Fall and Spring semesters, or just one or the other);
3) Courses required for the actuarial science major;
4) The relationship between U of I courses and the professional actuarial exams; and
5) Key principles for incoming freshmen.

We would like to meet and get to know each of you throughout your stay in our program. The actuarial science faculty and staff will do our best to help you prepare for what can be a wonderful and satisfying career.

Section 1: Sample Four-Year Schedule of Key Courses

The table below provides a sample, typical four-year plan for the key courses associated with an undergraduate actuarial science degree at the University of Illinois. We have not included electives and general education requirements – selections of those courses are largely personal, and are generally spread across the program in a manner consistent with the individual student’s interests, desired course load each semester, etc. In this table, we have focused on the key act sci and related courses. Specific required math, act sci, and finance courses are included, along with a few others (e.g., see discussion of Economics in part (2) of Section (5) below).

This table is not rigorous – this is just an example, and there is some flexibility in the timing of courses. For example, assuming prerequisites are met, there is no problem with a student reversing the orders of the Math 470-level courses in the junior and senior year. Also, many students enter UIUC with credit for one or more calculus courses, which would naturally alter the table below, and accelerate the taking of certain math courses. But we would definitely suggest that, as a general rule, an incoming student attempt to take at least the courses listed in the freshman and sophomore years by the end of her/his second year in the program, along with as many general education courses as is reasonable.
### Year | Fall Semester | Either Fall or Spring Semester | Spring Semester
---|---|---|---
**Freshman** | Math 220 or 221 Econ 102 | CS 101 or 105 or 125 | Math 231 Econ 103

**Sophomore** | Math 241 | ASRM 210 | ASRM 401

**Junior** | ASRM 402 ASRM 471 Fin 230 Fin 221 | | ASRM 472 ASRM 406 Fin 300

**Senior** | ASRM 410 Fin 321 | Fin/Econ Elective | ASRM 461 ASRM 450

*ASRM 472 may be replaced with ASRM 451

## Section 2: Listing of Key Courses

The material below identifies the key courses related to the actuarial science major, along with important prerequisites and the frequency with which the courses have been offered in recent academic years (F = Fall semester, S = Spring semester; we generally do not offer act sci courses in the summer, although some basic math, finance, and econ courses may be offered then).

Probably the two key “sequences” of courses (by “sequence,” we mean that each course in the sequence is a prerequisite for the next course in the sequence) for actuarial science majors are:

- Econ 102 or 103 → Fin 221 → Fin 300 → Fin 321.

With regard to the first sequence above, fulfilling a step in this sequence during each semester of your first 2 ½ years (or possibly less, if you have advanced placement credit for the early calculus classes) should be your highest priority early in the program. Another priority during that timeframe is to take an economics course, which is a prerequisite for beginning the Fin 221-300-321 sequence. This sequence is discussed further in Section (5).

Most of the courses below are worth 3 credit hours, although some are worth either 4 or 5. The credit hours for courses are listed in the university catalog and in the timetable, both of which are online at [https://courses.illinois.edu/](https://courses.illinois.edu/) and [http://catalog.illinois.edu/](http://catalog.illinois.edu/). (Courses listed in **bold** are, for all intents and purposes, required for the act sci majors, while courses in *italics* are courses which may be taken to fulfill certain “select courses from this group” requirements. Other courses are listed because they are either prerequisites for required courses, or they are useful or common electives for act sci students.)
<table>
<thead>
<tr>
<th>Course #</th>
<th>Course Title</th>
<th>Key Prerequisite(s)</th>
<th>(Recently)</th>
</tr>
</thead>
<tbody>
<tr>
<td>ASRM 210</td>
<td>Theory of Interest</td>
<td>Math 231</td>
<td>F, S</td>
</tr>
<tr>
<td>Math 220/1</td>
<td>Calculus I</td>
<td></td>
<td>F, S</td>
</tr>
<tr>
<td>Math 231</td>
<td>Calculus II</td>
<td>Math 220/1</td>
<td>F, S</td>
</tr>
<tr>
<td>Math 241</td>
<td>Calculus of Several Variables</td>
<td>Math 231</td>
<td>F, S</td>
</tr>
<tr>
<td>ASRM 401</td>
<td>Actuarial Statistics I</td>
<td>Math 241</td>
<td>S</td>
</tr>
<tr>
<td>ASRM 402</td>
<td>Actuarial Statistics II</td>
<td>ASRM 401</td>
<td>F</td>
</tr>
<tr>
<td>ASRM 406</td>
<td>Linear Algebra &amp; Fin Apps</td>
<td>Math 241, ASRM 210</td>
<td>F, S</td>
</tr>
<tr>
<td>ASRM 450</td>
<td>Methods of Applied Statistics</td>
<td>ASRM 401</td>
<td>F, S</td>
</tr>
<tr>
<td>ASRM 471</td>
<td>Life Contingencies I</td>
<td>ASRM 401, ASRM 210</td>
<td>F</td>
</tr>
<tr>
<td>ASRM 409</td>
<td>Stock Processe for Fin &amp; Ins</td>
<td>ASRM 401</td>
<td>S</td>
</tr>
<tr>
<td>ASRM 410</td>
<td>Investments &amp; Financial Mrkts</td>
<td>ASRM 401</td>
<td>F, S</td>
</tr>
<tr>
<td>ASRM 451</td>
<td>Basics of Statistical Learning</td>
<td>ASRM 401, ASRM 450</td>
<td>F, S</td>
</tr>
<tr>
<td>ASRM 461</td>
<td>Loss Models</td>
<td>ASRM 401</td>
<td>S</td>
</tr>
<tr>
<td>ASRM 469</td>
<td>Casualty Actuarial Science</td>
<td>ASRM 401</td>
<td>F</td>
</tr>
<tr>
<td>ASRM 472</td>
<td>Life Contingencies II</td>
<td>ASRM 471</td>
<td>S</td>
</tr>
<tr>
<td>Math 490</td>
<td>Advanced Topics in Mathematics*</td>
<td></td>
<td>(occasional)</td>
</tr>
<tr>
<td>ASRM 392</td>
<td>Actuarial Problem Solving</td>
<td></td>
<td></td>
</tr>
<tr>
<td>CS 101/105</td>
<td>Introduction to Computing</td>
<td></td>
<td>F, S</td>
</tr>
<tr>
<td>CS 125</td>
<td>Intro to Computer Science</td>
<td></td>
<td>F, S</td>
</tr>
<tr>
<td>Econ 102</td>
<td>Microeconomic Principles</td>
<td></td>
<td>F, S</td>
</tr>
<tr>
<td>Econ 103</td>
<td>Macroeconomic Principles</td>
<td></td>
<td>F, S</td>
</tr>
<tr>
<td>Econ 302</td>
<td>Intermediate Microecon. Theory</td>
<td>Econ 102</td>
<td>F, S</td>
</tr>
<tr>
<td>Econ 303</td>
<td>Intermediate Macroecon. Theory</td>
<td>Econ 103</td>
<td>F, S</td>
</tr>
<tr>
<td>Accy 200</td>
<td>Fundamentals of Accounting</td>
<td></td>
<td>F, S</td>
</tr>
<tr>
<td>Accy 201</td>
<td>Accounting and Accountancy I</td>
<td></td>
<td>F, S</td>
</tr>
<tr>
<td>Fin 221</td>
<td>Corporate Finance</td>
<td>Econ 102 or 103</td>
<td>F, S</td>
</tr>
<tr>
<td>Fin 230</td>
<td>Introduction to Insurance</td>
<td></td>
<td>F</td>
</tr>
<tr>
<td>Fin 300</td>
<td>Financial Markets</td>
<td>Fin 221</td>
<td>F, S</td>
</tr>
<tr>
<td>Fin 321</td>
<td>Advanced Corporate Finance</td>
<td>Fin 300</td>
<td>F, S</td>
</tr>
<tr>
<td>Fin 431</td>
<td>Property-Liability Insurance</td>
<td>Fin 230</td>
<td>S</td>
</tr>
<tr>
<td>Fin 432</td>
<td>Managing Fin Risk for Insurers</td>
<td>Fin 300, Math 409</td>
<td>S</td>
</tr>
<tr>
<td>Fin 434</td>
<td>Employee Benefit Plans</td>
<td>Fin 300</td>
<td>F</td>
</tr>
</tbody>
</table>
Occasionally, a section of Math 490 is offered which can be considered an acceptable replacement for 400-level courses required for the act sci major. Some such Math 490 sections might be, for example, Pension Mathematics, or Financial Mathematics. Future offerings of such sections are dependent upon the availability of faculty resources.

Section 3: Courses Required for the Actuarial Science Major

Other than general education and overall credit hour requirements, the specific course requirements for the actuarial science major can be identified in six categories, as follows:

1) Calculus (Math 220/221, 231, and 241)
2) One of CS 101, CS 105, or CS 125 (CS 101 or 105 recommended)
3) Required actuarial science / mathematics core courses:
   ASRM 210
   ASRM 401 (or Math 461)
   ASRM 402 (also fulfills VEE in mathematical statistics – see Section 4 below)
   ASRM 406 **
   ASRM 450
   ASRM 471 (spring only)
   (Note: Stat 400 is a valid replacement for ASRM 401/Math 461, and Stat 410 is a valid replacement for ASRM 402. However, the approval of an actuarial science advisor is necessary for either of these substitutions.)
4) Three of the following advanced actuarial science courses are required:
   ASRM 472 (fall only)
   ASRM 409 (spring only)
   ASRM 410 (fall and spring)
   ASRM 461 (fall only)
   ASRM 469 (fall only)
   ASRM 451 (fall and spring)
   (One of these can be replaced by a special topics Math 490 course – e.g., financial mathematics – if approved by an actuarial science advisor.)
5) Required finance courses:
   Fin 221 (fulfills VEE in finance – see Section 4 below)
   Fin 300
   Fin 321 (fulfills VEE in finance – see Section 4 below)
6) Two additional courses are required, chosen from the following:
   Econ 302 (fulfills VEE in micro econ – see Section 4 below)
   Econ 303 (fulfills VEE in macro econ – see Section 4 below)
   Fin 230
   Fin 431
   Fin 432
   Fin 434
7) Other comments
   Accy 200 – while this course is not a graduation requirement, students will benefit from knowledge of this material. It is a highly recommended elective.
Stat 400 and 410 is an acceptable replacement for ASRM 401 and 402 (although this substitution requires the signed approval of an act sci advisor). Please note that you must complete the sequence you began. If you began with Stat 400, you must take Stat 410. If you began with ASRM 401, you must take ASRM 402.

Econ 102 and 103 are not required for the act sci degree, but are recommended (and fulfill VEE in economics – see Section 4 below).

** ASRM 406 is the primary requirement, intended for actuarial science majors. This course covers linear algebra in an actuarial and financial context. Math 415 is an acceptable alternative – but it is intended for engineering majors, rather than act sci majors.

Section 4: Relationships Between U of I Courses and Professional Actuarial Exams

Although not part of the formal degree requirements, those act sci students who are planning to undertake an actuarial career should consider the taking of national actuarial exams to be a core component of their preparation. In fact, students might want to plan their course schedules with the exams in mind – e.g., some students consider taking a slightly lighter load in those semesters when they are planning to study for and take an exam. Also, students are welcomed to take (for one credit hour) or sit in on the Math 370 section for the exam they plan to take – these once-per-week evening exam review sessions typically involve going over problems from past examinations, and can be very helpful in preparing for an exam. (We currently offer sections of Math 370 for exams 1/P and 2/FM each semester; occasionally, we also may be able to make arrangements for sessions dealing with exams MLC and/or MFE and/or 4/C in the future.)

At UIUC, we strive to teach the material that is on the preliminary actuarial examinations of both the SOA and CAS. The following describes how the exams and UIUC courses line up:

- **CAS 1 / SOA P: Probability.** Relevant courses are calculus through Math 241, and ASRM 401 (or Math 461). Based on the sample four-year schedule provided in Section 1, a student may want to aim for taking Exam P by the end of the sophomore year.
- **CAS 2 / SOA FM: Financial Mathematics.** The relevant course for the interest rate material is ASRM 210; additional financial economics material on this exam can be learned through some combination of independent study, taking or sitting in on Math 370 (Section FM) review sessions, a finance course, and/or a special FM finance seminar. A student could be ready to take Exam FM by his/her sophomore year (or freshman year, if the student enters with sufficient calculus credit). Note that you may take the actuarial exams in any order – e.g., Exam FM can be taken before Exam P, if your course schedule makes it logical to do so.
- **Investments and Financial Markets:** The majority of this material will be covered in ASRM 410.
- **Long Term Actuarial Mathematics:** ASRM 471 and 472
- **Short Term Actuarial Mathematics:** ASRM 461
- **Statistics for Risk Modeling:** ASRM 450 and 451
- **Modern Actuarial Statistics I:** ASRM 450, 451 and 409
- **Modern Actuarial Statistics II:** ASRM 451 and 461

Some additional information about the actuarial exams:

- Exam LTAM is currently a pencil-and-paper exam, offered twice per year, once in April, and once in October. The other preliminary exams are computer-based and generally offered more frequently. Specific information can be found at [www.beanactuary.org](http://www.beanactuary.org). Additional information can be found at [www.soa.org](http://www.soa.org) and at [www.casact.org](http://www.casact.org).
- Exams 1/P, 2/FM and 3F/IFM are co-sponsored by the Casualty Actuarial Society and the Society of Actuaries.
- Generally, exams can be taken in any order – they need not be taken sequentially according to their number or letter designations. CAS exam MAS II will assume students have knowledge of the material on MAS I.
- Our act sci graduates have a wide variety of exam passes when they leave the U of I. The average is probably about two, but many students each year have passed three, four, or even five exams by the time they graduate. We always suggest that students aim for passing (at least) two while in college, but in general, *more is better than fewer*.

**VEE:** Another aspect of professional actuarial education is the Validation by Educational Experience (VEE) requirement. The VEE requirements represent material that used to be tested on actuarial exams. Several years ago, the actuarial societies removed this material from the exams; instead of testing this material, they now require that, prior to getting a professional actuarial designation (i.e., an ASA or an ACAS), one must not only pass certain actuarial exams, but also take university-level classes in the VEE areas, and get a grade of at least a B-minus in each course.

Specifically, the VEE requirements include the topical areas of economics (both micro- and macro-economics, so generally two courses are necessary to fulfill the economics VEE requirement, although there can be exceptions), finance, and applied statistics. UIUC has had certain of our courses pre-approved as fulfilling these requirements. In particular, taking and receiving a grade of at least B-minus in the following UIUC courses will fulfill the VEE requirements in the three topical areas. These are the relevant courses most likely to be taken by act sci majors:

- **Economics:** Econ 102 and 103 (both are required). (The sequence Econ 302 and 303 also qualifies.)
- **Finance:** Fin 221. (Fin 321 also qualifies.)
- **Mathematical Statistics:** ASRM 409 (SOA only)

Currently, there are also various professional exams which fulfill VEE requirements. Additional information regarding the entire set of VEE requirements can be found at: [http://www.soa.org/education/exam-req/edu-vee.aspx](http://www.soa.org/education/exam-req/edu-vee.aspx).
Section 5: Key Principles for Act Sci Students

(1) **Calculus:** Your first priority is to determine where you should be in the three-course calculus sequence (Math 220/1, 231, and 241), and to complete that sequence. One of these courses should be taken each semester, until the sequence is finished (followed by the actuarial statistics courses for which calculus is a prerequisite: ASRM 401 and 402).

Note: Based on AP or other placement exams, you might enter the program with credit or proficiency acknowledgement for one or more of the calculus courses. This is fine, and means that you can start the program at an advanced point in the calculus sequence. But keep in mind that this is ultimately up to you – advanced placement credit need not be accepted, if you have reasons for not doing so. For example, even though you might be qualified to begin the calculus sequence with Math 231, if for some reason you are uncomfortable jumping into that course your first semester, you can always take Math 220 or 221 and build yourself a more comfortable foundation for the later courses. This can sometimes be a tough decision for new students; sometimes the first class meeting or two of a course will suggest that you might be better placed in a later or earlier course in the sequence. You should certainly strive to make that decision within the first week of classes. We suggest you make a point to sit in on the first class or two of each alternative course, look at the syllabi and texts, and then evaluate how you feel.

(2) **Economics:** While not required for the degree, the vast majority of act sci students do, and should, take Econ 102 and 103 in their freshman year. These are excellent courses to take, providing important insights into economics, as well as some preparation for later finance courses. (As mentioned in the prior section, they also fulfill the economics VEE requirement. In addition, they can fulfill certain UIUC general education requirements.)

(3) **Computer Science:** Almost all act sci students take CS 101 or 105. The CS course requirement is a good one to address in your freshman year. Whichever of these CS courses you take, you will definitely want to become familiar with at least two software packages fairly early on: Microsoft Word (word processing), and Microsoft Excel (spreadsheet). These will serve you well throughout your U of I program, as well as your actuarial (or any other business) career.

(4) **Theory of Interest:** ASRM 210 is the first true “actuarial” course you are likely to take. If you have advanced placement in calculus, you might be able to take ASRM 210 in your freshman year. Your sophomore year is also fine for ASRM 210 – but from the standpoint of taking a professional actuarial exam sooner than later, you might want to take ASRM 210 as soon as you can.
(5) **Finance courses:** Finance 221 is the first in a required three-course finance sequence (Fin 221, 300, and 321). The prerequisite for Fin 221 is either Econ 102 or 103. This means that Fin 221 can be taken as early as freshman year. (As mentioned in the prior section, Fin 221 fulfills the VEE requirement in finance.)

(6) **Illinois Students Transferring into Act Sci:** Non-act sci Illinois students getting B-minus grades or better in ASRM 210 and ASRM 401 (or Math 461 or Stat 400) are eligible to apply for transfer into the actuarial science curriculum. This cannot be done until those courses are completed and the grades are available. That means that there are courses – Fin 221, and certain advanced act sci courses, are examples – that a student _will not_ be able to register for until they are formally accepted into the act sci curriculum. This is in order to allow current act sci students priority in getting into their required courses. If there is room available in a course after a student has been admitted into the curriculum, they will be allowed to enroll.

(7) **Your Freshman Year:** Your first year at Illinois – and especially the first semester – will involve a number of new experiences and challenges. College is a different world than you are likely to have been exposed to before. Please bear in mind that many, many students struggle a bit in their first semester in college, and then thereafter they become accustomed to the process and proceed on a path to success.

(8) **Utilize your available resources:** Your family, your friends, faculty, your major advisor (Hi!) – we and many others are all here for you. Make the most of those resources throughout your college years – and we’ll all share in your successes with you!

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**Section 6: A note for international students**

We are happy you’re here. Please do make friends with the ISSS office. There are rules you must follow during your studies, and it is important that you do follow them. There website has a host of information: [http://isss.illinois.edu/](http://isss.illinois.edu/)

If you obtain an internship during the course of your studies, you must register for Math 399 Math/Actuarial Internship. There are limits on how many online courses you can count towards a full course of study. Please see your advisor or ISSS for more information.