Actuarial Science Program

Advising Notes, Academic Year 2018-2019

This document is designed to help actuarial science 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 ASRM-advising@illinois.edu, and our advisors will do their best to respond promptly (and perhaps even accurately!).

The material below is in five sections:

Contents

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 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 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 actuarial science courses. Specific required math, actuarial science, 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 just an example, and there is flexibility in the timing of courses. For example, assuming prerequisites are met, there is no problem with reversing the orders of some of the ASRM 400-level courses in the junior and senior year. However, please do check with an actuarial science advisor for suggestions.

Many students enter Illinois with credit for one or more calculus courses, which would alter the table below. 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 the 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 ASRM 199 CS	CS 101 or 105 or 125	Math 231 Econ 103
Sophomore	Math 241 ASRM 210	ACCY 200	ASRM 401 ASRM 406
Junior	ASRM 402 ASRM 471 Fin 230 Fin 221		ASRM 472* ASRM 409* Fin 300
Senior	Fin 321	Fin/Econ Elective ASRM 410, ASRM 461*	ASRM 450

*These classes may be replaced with ASRM 451, 469, or an approved section of ASRM 499. To fill graduation requirements, students should select at least **three** of ASRM 409, ASRM 410 (very strongly recommended), ASRM 451, ASRM 461, ASRM 469, ASRM 472, or an approved section of ASRM 499.

Section 2: Listing of Key Courses

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

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:

- Math 220/1 ➔ Math 231 ➔ Math 241 ➔ ASRM 401 ➔ ASRM 402
- Econ 102 or 103 ➔ Fin 221 ➔ Fin 300 ➔ Fin 321

With regard to the Math sequence above, fulfilling a step in this sequence during each semester of your first 2 ½ years (or possibly less, if you have 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.

ASRM 400-level courses can be clustered into four groups, each of which prepares students for a different area of actuarial practice. Each of the listings below offers the suggested order of coursework in an area of practice. However, the symbol → does not mean prerequisite. For

example, ASRM 409 is not listed on the books as a perquisite for either ASRM 472 or ASRM 410. It is possible to take ASRM 472 without ASRM 409. However, we highly recommend students to take ASRM 409 before ASRM 472 and ASRM 410, or take ASRM 409 concurrently with ASRM 472.

- Life and Annuities: ASRM 471 and ASRM 409 → ASRM 472
- Finance and Investment: ASRM 409 → ASRM 410
- Property and Casualty: ASRM 450 → ASRM 461 → ASRM 469
- Predictive Analytics: ASRM 450 →ASRM 451→ASRM 499 (Predictive Analytics)

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/ and http://catalog.illinois.edu/.

Courses listed in **bold** are, essentially, required for the actuarial science majors, while courses in italics are courses which may be taken to fulfill certain "select one or two courses from this group" requirements. Other courses are listed are either prerequisites for required courses or they are useful or common electives for actuarial students.

Course #	Course Title	Key Prerequisite(s)	Semester Given (Recently)
ASRM 210	**Theory of Interest**	**Math 231**	**F, S**
Math 220/1	**Calculus I**	**-----**	**F, S**
Math 231	**Calculus II**	**Math 220/1**	**F, S**
Math 241	**Calculus of Several Variables**	**Math 231**	**F, S**
ASRM 401	**Actuarial Statistics I**	**Math 241**	**S**
ASRM 402	**Actuarial Statistics II**	**ASRM 401**	**F**
ASRM 406	**Linear Algebra & Fin Apps**	**Math 241, ASRM 210**	**F, S**
ASRM 409	***Stoch Processes for Fin & Ins***	***ASRM 401***	***S***
ASRM 410	**Investments & Financial Mrkts**	**ASRM 401**	**F, S**
ASRM 450	**Methods of Applied Statistics**	**ASRM 401**	**F, S**
ASRM 461	**Loss Models**	**ASRM 401**	**F, S**
ASRM 471	**Life Contingencies I**	**ASRM 401, ASRM 210**	**F**
ASRM 472	***Life Contingencies II***	***ASRM 471***	***S***
ASRM 392	Actuarial Problem Solving		
ASRM 451	*Basics of Statistical Learning*	*ASRM 450*	*F, S*
ASRM 469	*Casualty Actuarial Science*	*ASRM 401*	*(occasional)*
ASRM 499	Advanced Topics in Actuarial Science*	--	(occasional)
ASRM 199 CS	*Foundations of Data Management*	-----	*F*
CS 101 / 105	*Introduction to Computing*	-----	*F, S*
CS 125	*Intro to Computer Science*	-----	*F, S*
Econ 102	Microeconomic Principles	-----	F, S
Econ 103	Macroeconomic Principles	-----	F, S
Econ 302	*Intermediate Microecon. Theory*	*Econ 102*	*F, S*
Econ 303	*Intermediate Macroecon. Theory*	*Econ 103*	*F, S*
Accy 200	Fundamentals of Accounting	-----	F, S
Accy 201	Accounting and Accountancy I	-----	F, S
Fin 221	**Corporate Finance**	**Econ 102 or 103**	**F, S**
Fin 230	*Introduction to Insurance*	-----	*F (generally)*
Fin 300	**Financial Markets**	**Fin 221**	**F, S**
Fin 321	**Advanced Corporate Finance**	**Fin 300**	**F, S**
Fin 431	*Property-Liability Insurance*	*Fin 230*	*S*
Fin 432	*Managing Fin Risk for Insurers*	*Fin 300, Fin 230*	*F*
Fin 434	*Employee Benefit Plans*	*Fin 300*	*S*

*Occasionally, a section of ASRM 499 is offered which can be considered an acceptable replacement for 400-level courses required for the actuarial science major. Some such 499 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 or ASRM 199 CS 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 (fall only)

(Note: Stat 400 + Stat 410 is a valid replacement for ASRM 401 + 402 if taken as a sequence. However, the approval of an actuarial science advisor is necessary for this substitution. ASRM 401 is a better choice than Math 461 and Stat 400 as it better prepares students for Exam P. Either ASRM 402 or the combination of Stat 400 and Stat 401 fulfils the SOA/CAS VEE Mathematical Statistics credit.)

(4) Three of the following advanced actuarial science courses are required:

ASRM 410
ASRM 461
ASRM 469 (fall only)
ASRM 472 (spring only)

(One of these can be replaced by ASRM 409, ASRM 451 or a special topics ASRM 499 course if approved by an actuarial science advisor.)
Most students should plan to take ASRM 410, ASRM 461, ASRM 469 and ASRM 472 since those are the regularly-offered courses.

(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. If you take Fin 221 before July 2019, you will be exempt from the Accounting portion of the VEE requirements. If you take Fin 221 after July 2019, you will need to take Accy 200 in addition to Fin 221 in order to obtain VEE Accounting and Corporate Finance credit from the SOA.

Econ 102 and 103 are not required for the actuarial science 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 actuarial science majors.

Section 4: Relationships Between Illinois Courses and Professional Actuarial Exams

Although not part of the formal degree requirements, actuarial science students who are planning to pursue an actuarial career should consider the national actuarial exams to be a core component of their preparation. In fact, students will want to plan their course schedules with the exams in mind. Students may 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 ASRM 392 section for the exam they plan to take. These once-per-week evening 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 ASRM 392 for exams 1/P and 2/FM each semester. Occasionally, we also may be able to offer sessions for exams IFM or other ASA/ACAS-level exams.

At Illinois, we strive to teach the material that is on the preliminary actuarial examinations (Exams P, FM, MAS I, MAS II, 5, SRM, STAM, and LTAM). The following describes how the exams and Illinois courses line up:

- **Exam 1 / P: Probability.** Relevant courses are calculus through Math 231, 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.

- **Exam 2 / 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 ASRM 392 (Section FM) review sessions, a finance course, or a special FM finance seminar. A student could be ready to take Exam FM by their 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.

- **Exam IFM: Investments and Financial Markets** This exam tests the material covered by ASRM 410. Depending on the timing and selection of courses, a student could take this exam in their junior or senior year.

- **Exam-Course Correspondence**
  - Joint SOA and CAS
    - Exam 1 / P: ASRM 401
    - Exam 2 / FM: ASRM 210
    - Exam 3F / IFM: ASRM 410
  - SOA
    - Exam SRM: ASRM 450 & ASRM 451
    - Exam STAM: ASRM 461
    - Exam LTAM: ASRM 471 and 472
    - Exam PA: ASRM 499 (Predictive Analytics)
  - CAS
    - MAS I: ASRM 402, ASRM 409 & ASRM 450
    - MAS II: ASRM 461 & ASRM 451
    - 5: ASRM 469

Some additional information about the actuarial exams:

- Specific information on actuarial exams can be found at www.beanactuary.org . Additional information can be found at www.soa.org and at www.casact.org.
- 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 exams, generally offered more frequently.
- Exams 1/P, 2/FM, and 3F/IFM are currently co-sponsored by the Casualty Actuarial Society and the Society of Actuaries.
- Our actuarial science graduates have a wide variety of exam passes when they leave the U of I. The average is about three, but every year there are students who have passed 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 actuarial societies require that, prior to earning a professional actuarial designation (i.e., an ASA or an ACAS), one must take university-level classes in the VEE areas, and earn at least a B-minus in each course.

The VEE requirements cover 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 statistics. Illinois 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 Illinois courses will fulfill the VEE requirements in the three topical areas. These are the relevant courses most likely to be taken by actuarial science majors:

- *Economics*: Econ 102 and 103 (both are required). (The sequence Econ 302 and 303 also qualifies.)
- *Accounting and Finance*: Fin 221. (Fin 321 or Fin 521 also qualify.). This requirement will change on July 1, 2019. If you complete Fin 221 (or Fin 321 or Fin 521) after this date, you will also need to take a financial accounting class to earn VEE credit. ACCY 200 is required for the accounting part.
- *Mathematical Statistics*: ASRM 402 or both Stat 400 and Stat 410.

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 .

A complete map between SOA/CAS exams and UI ASRM courses can be found at: https://math.illinois.edu/academics/actuarial-science/preparing-for-professional-exams.

Section 5: Key Principles for Actuarial Science Students

- ***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 knowledge for one or more of the calculus courses. This 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 you are uncomfortable jumping into that course your first semester, you can always take Math 220 or 221 and build a more comfortable foundation for the later courses. This can be a tough decision for new students; sometimes the first class meeting or two of a courses 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 sit in on the first class or two of each alternative, look at the syllabi and texts, and then evaluate how you feel.
- ***Economics***: While not required for the degree, the vast majority of actuarial science 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 Illinois general education requirements.)
- ***Computer Science***: Almost all actuarial science students take CS 101 or 105 or ASRM 199 section CS. The CS course requirement is a good one to address in your freshman year. You will definitely want to become familiar with Excel fairly early on. Skills in VBA, R, Python, SAS, SQL, and advanced Excel techniques will serve you well throughout your time with us as well as your actuarial--or any other business--career. Freshmen who select ASRM 199 CS will get early exposure to some of these tools. The course is currently only available to incoming freshman, but we hope to expand it in the

future.

- ***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.
- ***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.)
- ***Illinois Students Transferring into Actuarial Science***: Non- actuarial science Illinois students getting B-minus grades or better in ASRM 210 and ASRM 401 (or Stat 400 or Math 461) 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 actuarial science courses, are examples – that a student ***will not*** be able to register for until they are formally accepted into the actuarial science curriculum. This is in order to allow current actuarial science 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.
- ***Your Freshman Year***: Your first year at the U of I – 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.
- ***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!

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/

If you obtain an internship during the course of your studies, you should register for ASRM 398, Actuarial Internship. However, if it is the only class you are taking in a semester, then we recommend Math 399 Section A as the math class is approved for a special low tuition rate. 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.