University of Iowa Courses and Society of Actuaries Examinations

"In the forefront of actuarial folklore stands the belief that the actuarial examinations constitute a mystery impenetrable by mortal man."   Charles A. Spoerl, *Transactions of the Society of Actuaries*, Volume 1 (1949)

"The primary unifying force of the actuarial profession in North America is the shared experience of the actuarial exams. These difficult and competitive exams . . . yield a bond among actuaries that is stronger and longer lasting than that produced by the entry trials of other professions and careers. Actuaries are unique in the extent to which they remember and discuss their qualifying process, contribute their time to the education and examinations of prospective actuaries, and share a sense of community with those who have traveled the same road. The exams are sufficiently difficult to produce a sense of accomplishment best appreciated by other successful candidates."
                              Society of Actuaries Task Force on the Actuary of the Future (1988)

Some Facts: The University of Iowa (UI) has the second oldest actuarial science program in the U.S.A. It began with the course "The Mathematical Theory of Insurance," taught by Dr. Westfall, in academic year 1902/1903. Since 1913, actuarial science courses have been taught every year at UI. Five past presidents of the Society of Actuaries (SOA) and two past presidents of the Casualty Actuarial Society (CAS) were UI students.
Four SOA Presidential Awards were given in 2017; three of the four awardees are UI graduates.
The total number of new Fellows of the Society of Actuaries (FSA) in 2000 to 2017 is 11,984, of these 263 were UI students. http://www.stat.uiowa.edu/fellows-society-actuaries-fsa   In other words, UI has produced about **2.2%** of all new FSA's.

Required Courses for the BS degree in Actuarial Science
- CS:1210 Computer Science I: Fundamentals (4 s.h.)
- ECON:1100 Principles of Microeconomics (4 s.h.)
- ECON:1200 Principles of Macroeconomics (4 s.h.)
- MATH:1850 Calculus I (4 s.h.)
- MATH:1860 Calculus II (4 s.h.)
- MATH:2700 Introduction to Linear Algebra (4 s.h.)
- MATH:2850 Calculus III (4 s.h.)
- MATH:3770 Fundamental Properties of Spaces and Functions I (4 s.h.)
- STAT:3100 Introduction to Mathematical Statistics I (3 s.h.)
- STAT:3101 Introduction to Mathematical Statistics II (3 s.h.)
- STAT:4100 Mathematical Statistics I (3 s.h.)
- STAT:4101 Mathematical Statistics II (3 s.h.)
- ACTS:3080 Mathematics of Finance I (3 s.h.)
- ACTS:4130 Quantitative Methods for Actuaries (3 s.h.)
- ACTS:4180 Life Contingencies I (3 s.h.)
- ACTS:4280 Life Contingencies II (3 s.h.)
- ACTS:4380 Mathematics of Finance II (3 s.h.)

ACTS:4280 (3 s.h.) may be substituted with **both** ACTS:6480 Loss Distributions (3 s.h.) and ACTS:6580 Credibility and Survival Analysis (3 s.h.).
In exceptional cases, the advisor may waive STAT:3100 and/or STAT:3101. STAT:3120 is **not** sufficiently rigorous to be a replacement for STAT:3100 and 3101.

Students are strongly advised to take honors sections of Mathematics courses, if they are available. Also, they should consider taking MATH:3600 Introduction to Ordinary Differential Equations (useful for life contingencies and mathematical finance/financial engineering) and STAT:6300 Probability and Stochastic Processes I. For satisfying the General Education Program requirements in Natural Sciences, calculus-based courses such as PHYS:1611, 1612 are recommended.

Graduation with Honors in Actuarial Science

To graduate with honors in Actuarial Science, a student must complete the following five courses in addition to all courses required for the major (including ACTS:4280). Also, the student must maintain a GPA of at least 3.40 in departmental courses and a UI cumulative GPA of 3.33.

- ACTS:6480 Loss Distributions (3 s.h.)
- ACTS:6580 Credibility and Survival Analysis (3 s.h.)
- FIN:3300 Corporate Finance (3 s.h.)
- MATH:3600 Introduction to Ordinary Differential Equations (3 s.h.)
- STAT:4560 Statistics for Risk Modeling (replacement of STAT:4510) (3 s.h.)

In exceptional cases, the advisor may permit substitution.

The ASA pathway   The diagram below shows the latest requirements, in five columns, for becoming an Associate of the Society of Actuaries (ASA). UI provides courses for the first three columns (Introductory I, Introductory II, and Actuarial). Do note that the examinations (in blue) are what recruiters care about and what determine salaries. Some companies would not interview students with no exams passed. The VEE, which stands for Validation by Educational Experience, in green, merely means that one gets a B- or better grade in certain university courses.
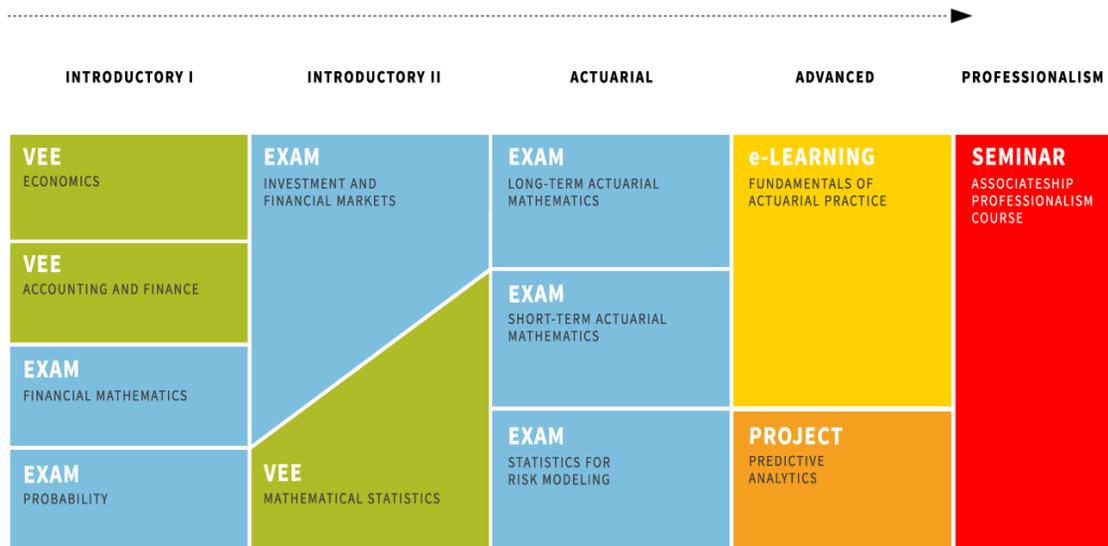
The following table shows how the first six SOA exams are covered by UI courses.

SOA Examinations	UI Courses
FM Financial Mathematics	ACTS:3080
P Probability	STAT:3100 and/or 4100
IFM Investment and Financial Markets	ACTS:4380, FIN:3300
LTAM Long-Term Actuarial Mathematics	ACTS:4130, 4180, 4280
STAM Short-Term Actuarial Mathematics	STAT:4101, ACTS:6480, 6580
SRM Statistics for Risk Modeling	STAT:4540, 4560

The syllabi of ACTS courses and STAT:4560 are based on SOA exams.

The following table shows how SOA's VEE requirements can be satisfied by UI courses (B- grade or higher), Advanced Placement Examinations (grade 4 or 5), or College Level Examination Program Tests (grade between 53 to 80).

VEE	UI Courses	AP Exams	CLEP Tests
Accounting & Finance	ACCT:2100, FIN:3300		Financial Accounting
Economics	ECON:1100, 1200 **or** ECON:3100, 3150	Micro, Macro	Micro, Macro
Mathematical Statistics	STAT:3101 **or** 4101 **or** 5101		

The SOA accepts courses taken at other universities or community colleges; see SOA's "VEE Directory of Approved Courses and Alternate Options." Also, see the answer to "Can I use transferred courses for VEE credit?" in https://www.soa.org/Education/Exam-Req/Resources/edu-vee-approval-faq.aspx

Below is a sample schedule for a student who needs to start from Calculus I. General Education requirements are not shown.

Year	Fall Semester	Spring Semester
1	MATH:1850 Calculus I CS:1210 Computer Science I: Fundamentals ECON:1100 Principles of Microeconomics ACTS:1001 Introductory Seminar Actuarial Science	MATH:1860 Calculus II MATH:2700 Introduction to Linear Algebra ECON:1200 Principles of Macroeconomics
2	MATH:2850 Calculus III STAT:3100 Introduction to Mathematical Statistics I	MATH:3770 Fundamental Properties of Spaces and Functions I STAT:3101 Introduction to Mathematical Statistics II ACTS:3080 Mathematics of Finance I
3	STAT:4100 Mathematical Statistics I ACTS:4130 Quantitative Methods for Actuaries FIN:3300 Corporate Finance	STAT:4101 Mathematical Statistics II ACTS:4180 Life Contingencies I ACTS:4380 Mathematics of Finance II
4	ACTS:4280 Life Contingencies II STAT:4540 Statistical Learning STAT:4560 Statistics for Risk Modeling	ACTS:6480 Loss Distributions ACTS:6580 Credibility and Survival Analysis

Notes
(i)   ACTS:1001, 4130, 4180, 4280, 6480 and 6580, and STAT:3100, 3101, 4100, 4101, 4540 and 4560 will be offered only once each year; the table above shows the semester when the course is offered. ACTS:3080 and 4380, and FIN:3300 are offered in both fall and spring semesters. FIN:3300 may also be offered in the summer.
(ii)   Most undergraduate students will take ACTS:3080, the course for Exam FM, in the spring semester of their sophomore year, while transfer students will probably take it in the fall semester of their junior year. Freshmen without the pre-requisite but with good calculus grades can seek permission to take ACTS:3080 in the spring semester. Taking ACTS:3080 earlier can mean passing Exam FM earlier. The person who can waive the pre-requisite requirement is Dr. Michelle Larson, the instructor of the course.
(iii)   For actuarial science majors, ACTS:3080 serves as pre-requisite for FIN:3300; there is no need to take FIN:3000. The procedure to register for FIN:3300 can be found in https://stat.uiowa.edu/resources/news-announcements/2018-fall-class-registration-early-registration-begins-april-9   FIN:3300 covers parts of Exam IFM **and** satisfies the VEE corporate finance requirement.
(iv)   Exams FM and P, easiest of all actuarial examinations, are offered **six** times each year. Exam P is offered in January, March, May, July, September, and November, and FM in February, April, June, August, October, and December. To help you pass these two examinations, we have two pass/fail 1 s.h. prep courses, ACTS:3110 and 3210. These two exams are not ordered; you can write P before FM, or FM before P. There is no public record of how many times a student has

attempted an actuarial examination; in other words, failing an actuarial exam has no penalty other than the exam fee. These are multiple choice examinations; you can always be lucky. There is a Prometric Test Center in Coralville.

Second Major in Mathematics (Program C)
For this major, you only need to take two more Mathematics courses – a post-calculus course and an upper-level course. MATH:3600 Introduction to Ordinary Differential Equations (useful for life contingencies and mathematical finance/financial engineering) is highly recommended as the post-calculus course. Consider taking MATH:4820/CS:4720 Optimization Techniques as the upper-level course, but note that it has MATH:3800/CS:3700 Elementary Numerical Analysis, which is not counted as an upper-level course, as pre-requisite. Students interested in graduate study in a mathematical science area (including mathematical finance/financial engineering) may want to take a mathematical analysis course such as MATH:5200. Consider getting the BA, not the BS, in Mathematics, because it seems more impressive to append the letters "BA, BS" after your name than just "BS." If you do not want to take any Mathematics courses beyond the required ones, apply for a Minor in Mathematics.

Second Major in Statistics
There are three tracks that you can choose. The "Mathematical Statistics" track has the least number of additional courses for you. The "Statistical Computing and Data Science" track may provide useful tools for a practicing actuary. In the future, there may be a B.S. degree in Data Science.
https://stat.uiowa.edu/undergraduate-programs/bs-statistics#overlay-context=undergraduate-programs

Large Data Analysis Certificate
http://www.stat.uiowa.edu/undergraduate-programs/large-data-analysis-certificate

Risk Management and Insurance Certificate
Offered through the Vaughan Institute of Risk Management and Insurance of our business college.
https://tippie.uiowa.edu/about-tippie/centers-institutes/vaughan-institute
For information and a curriculum overview, contact RMI advisor Bryce Parker bryce-parker@uiowa.edu

Minor in Business Administration
https://tippie.uiowa.edu/current-students/undergraduates/academics/majors-and-minors/minor-business-administration

Master of Finance program
https://tippie.uiowa.edu/future-graduate-students/masters-programs/finance
For information, contact Director of Admissions Jennifer Carter jennifer-carter@uiowa.edu

Certified Actuarial Analyst (CAA) The CAA qualification signifies an understanding of technical and math skills used in a variety of actuarial support and analytical roles.
https://www.soa.org/resources/announcements/press-releases/2016/soa-announces-new-subsidiary/

Gamma Iota Sigma is an international risk management, insurance and actuarial science collegiate fraternity. Its purpose is to encourage, enhance, and sustain student interest and professionalism in insurance, risk management and actuarial science programs. By utilizing the valuable resources of Gamma Iota Sigma, members will establish a strong network and distinguish themselves as young risk management & insurance professionals. The Beta Alpha Chapter at the University of Iowa was chartered in April 2007. https://tippie.uiowa.edu/content/gamma-iota-sigma

The annual **Actuarial Science, Insurance and Risk Management Job Fair** is usually held in late September. Treat the date as a deadline for passing actuarial exams.