

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. Spoorl, *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. Currently, three members of the SOA Board of Directors are UI alumni. The total number of new Fellows of the Society of Actuaries (FSA) from 2000 to 2018 is 12,839, of these 280 were UI students. <http://www.stat.uiowa.edu/fellows-society-actuaries-fsa> In other words, in these 19 years UI has produced about **2.2%** of all new FSA’s. The number of Fellows of the Casualty Actuarial Society (FCAS) from UI in these 19 years is 43. <https://stat.uiowa.edu/fellows-casualty-actuarial-society-fcas>

Required Courses for the BS degree in Actuarial Science

- CS:1210 Computer Science I: Fundamentals (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/IGPI:3100 Introduction to Mathematical Statistics I (3 s.h.)
- STAT:3101/IGPI:3101 Introduction to Mathematical Statistics II (3 s.h.)
- STAT:4100/IGPI:4100 Mathematical Statistics I (3 s.h.)
- STAT:4101/IGPI: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.

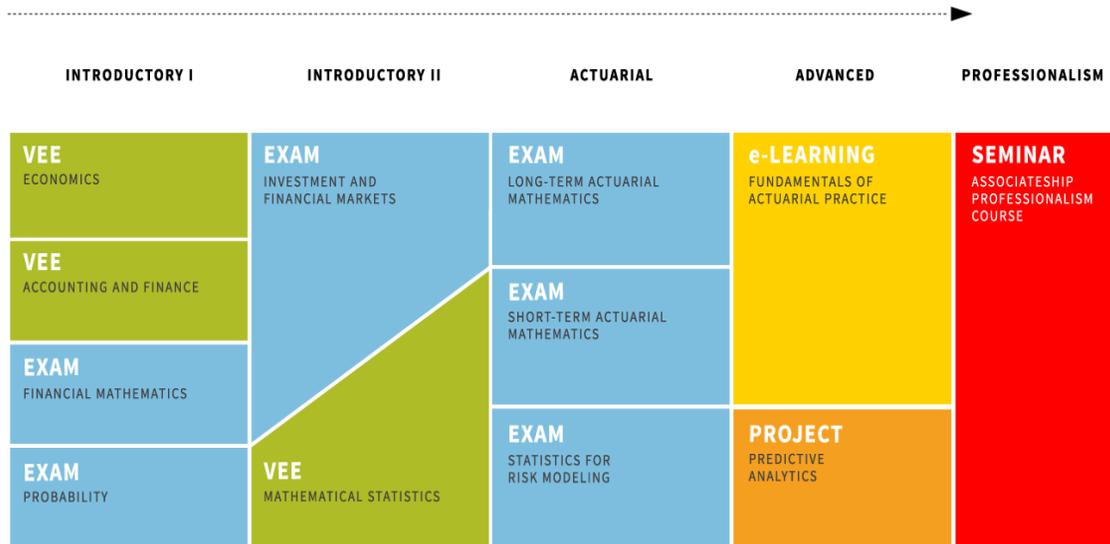
Graduation with Honors in Actuarial Science

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 below, are what recruiters care about and what determine salaries. Some companies would not interview students with no exams passed. VEE (Validation by Educational Experience), in green, merely means that one gets a B- or better grade in certain university courses; see top of next page.



The following table shows how the first six SOA exams are covered by UI courses.

| SOA Examinations | UI Courses |
|---------------------------------------|----------------------------------|
| FM Financial Mathematics | ACTS:3080, 3210 |
| P Probability | STAT:3100 and/or 4100; ACTS:3110 |
| IFM Investment and Financial Markets | ACTS:4380, 4010; 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 the SOA exams. Exam prep courses (1-hour, pass/fail) are shown in orange.

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 ACTS:1001 Introductory Seminar Actuarial Science | MATH:1860 Calculus II MATH:2700 Introduction to Linear Algebra |
| 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, 4380, 6480 and 6580, and STAT:3100, 3101, 4100, 4101, 4540 and 4560 are offered only once each year; the table above shows the semester when the course is offered. ACTS:3080 and FIN:3300 are offered in both fall and spring semesters. FIN:3300 may also be offered in the summer or as a DOE (Distance and Online Education) course.
- (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 (or fall semester of their sophomore year). 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/spotlight/2019-spring-class-registration> FIN:3300 covers parts of Exam IFM **and** satisfies the SOA VEE corporate finance requirement. It is also a required course for Honors in Actuarial Science.
- (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. <https://www.soa.org/education/general-info/default.aspx>
- (v) The annual job fair for actuarial students is usually held in late September or early October. To be competitive, a final-year student should have passed three exams (FM, P and IFM) by then. Exam IFM is offered in March, July, and November. For IFM, you need to have ACTS:4380 and FIN:3300. Also, take the Exam IFM prep course ACTS:4010.

Other Information

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 financial engineering) may want to take an 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, then apply for a Minor in Mathematics.

Second Major in Statistics There are three tracks. The “Mathematical Statistics” track has the least number of additional courses for you; choose STAT:6300 Probability and Stochastic Processes I. <https://stat.uiowa.edu/undergraduate-programs/bs-statistics#overlay-context=undergraduate-programs>

Second Major in Data Science <https://stat.uiowa.edu/data-science>

Minor in Computer Science <https://cs.uiowa.edu/undergraduate-programs/cs-minor-requirements>
Choose CS:3330 Algorithms and CS:3700/MATH:3800 Elementary Numerical Analysis.

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>

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

B.S./M.S. programs There are two combined B.S./M.S. programs available to actuarial science students. The M.S. degrees are offered by our business college. One is **M.S. in Business Analytics** and the other is **M.S. in Finance**. It may be possible to complete both B.S. and M.S. degrees in five years, instead of the usual six. <https://tippie.uiowa.edu/future-graduate-students/masters-programs>

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.caa-global.org/>

Gamma Iota Sigma is an international risk management, insurance and actuarial science collegiate fraternity. The Beta Alpha Chapter at UI was chartered in April 2007.

<https://tippie.uiowa.edu/content/gamma-iota-sigma>

Credentialed UI alumni

<https://stat.uiowa.edu/associates-society-actuaries-asa>

<https://stat.uiowa.edu/fellows-society-actuaries-fsa>

<https://stat.uiowa.edu/associates-casualty-actuarial-society-acas>

<https://stat.uiowa.edu/fellows-casualty-actuarial-society-fcas>