

Actuarial Science Overview

Actuarial science is the discipline of using mathematical and statistical methods to analyze risk in insurance, finance, and related fields. Professionals who work in the field of actuarial science are called Actuaries. To become an accredited Actuary, one must pass a series of extremely rigorous exams as well as successfully complete additional requirements. It takes about ten years of study (which is done concurrently with employment or college) to become fully accredited, although taking significantly less or more time to do so is not uncommon. Actuary is consistently ranked among the top careers in the country (rarely outside of the top five) due in part to the well above-average salaries, the challenging/rewarding nature of the work, and the tendency to receive great benefits from employers. Most Actuaries have a Bachelors Degree in fields such as actuarial science, mathematics, statistics, risk management, finance, economics, or other quantitative disciplines. However, it is possible to become an Actuary without such a degree if you have a strong background in mathematics and the ability to pass actuarial exams.

The vast majority of Actuaries are employed by either insurance companies or consulting firms. Employers traditionally have extremely generous benefits for actuarial students (Actuaries who are not accredited) which can include having all exam materials and registration fees paid for, ~90-150 paid study hours per exam attempt, automatic pay raises for each exam passed, bonuses for passing an exam on your first attempt, fully paid for expenses for actuarial conferences around the country, etc. Actuarial internships are also traditionally high paying, with \$20-30 hourly rates being common.

There are two accrediting actuarial societies in the United States, the Casualty Actuarial Society (CAS) and the Society of Actuaries (SOA). The CAS has about 6,000 members, and focuses primarily on property&casualty disciplines such a auto insurance. The SOA has about 22,000 members and focuses primarily on health and life disciplines. The first four actuarial exams (P/1, FM/2, MFE/3F, and C/4) are required by both the CAS and the SOA. All exams and additional requirements past this point are unique to each society. The first level of accreditation, Associate, is obtainable after the first eight exams and additional requirements for the CAS, and after the first five exams and additional requirements for the SOA. The final level of accreditation, Fellow, is obtainable in both societies after the completion of three more exams and additional requirements. Both societies also offer a supplemental designation, Chartered Enterprise Risk Analyst, upon completion of a specialized exam.

Each exam covers different topics, with material becoming increasingly specialized and applicable in later exams. Exams are generally three to five hours in length, but recently some shorter exams (1.5-2.5 hours in length) were created. The first four exams, known collectively as the preliminary exams, cover Probability, Financial Mathematics, Models for Financial Economics, and Construction and Evaluation of Actuarial Models. These exams can be taken in any order, however a firm grasp of the material covered in the first two exams is assumed in the third and fourth. Additionally, a strong grasp of

calculus is assumed for every exam. Each exam typically has a 30-50% pass rate, and the exams are offered at frequencies ranging from every other month (for exam P/1 and FM/2) to twice a year (upper level exams). The preliminary exams are multiple choice, with 30-35 questions each. Later exams are largely in essay format, although there are a few exceptions. Exams are graded on a scale from 1-10, with 10 being the highest score possible. A score of 6 or above constitutes a pass, while conversely a score of 5 or below is a failure. Exams that have been passed cannot be repeated for a higher score.

Some colleges and universities, such as Illinois State University and the University of Illinois, have formal actuarial science programs and degrees that help students prepare for taking actuarial exams. Although Illinois Wesleyan does not have a formal program, there are certain classes that I would recommend taking that can help prepare you for the exams and the actuarial profession. Three of the most important classes you can take at IWU are Introduction to Economics (ECON 100), Financial Management (FIS 303), and Regression and Time Series (MATH 303). If completed with a grade of B- or higher, each of these classes count as a Validation by Educational Experience (VEE) credit for both the SOA and the CAS. VEE credit must be obtained for all three topics (Economics, Corporate Finance, and Applied Statistical Methods) to become an Associate of either society. It should be noted that the Economics credit can also be obtained by getting a score of 4 or 5 on both the AP Microeconomics and the AP Macroeconomics exams. If these credits are not obtained through these classes (or the AP exams), there are other exams and courses that can be taken outside of IWU for VEE credit.

The most important class that you can take at Illinois Wesleyan to prepare yourself for the actuarial exams is Probability (MATH 324). This course teaches the fundamentals of mathematical probability, which are crucial to the actuarial profession and several exams. Upon completion of this course, you should have a firm grasp of roughly 70% of the material covered in the first actuarial exam, P/1. Most of the remaining material for P/1 is covered in the class Mathematical Statistics (MATH 325), which is another incredibly important class to take. Other topics covered in MATH 325 show up in later exams such as C/4 and the CAS exam ST. I also recommend taking core math classes such as the Calculus/Calculus Analysis sequence and Linear Algebra, as knowledge of these topics are largely assumed on the exams.

There are other classes outside of the Mathematics department that are useful for preparing for the actuarial profession. Investments (FIS 309) paired with the aforementioned FIS 303 cover some of the basic concepts of exams FM/2 and MFE/3F. However, since these courses were not designed with actuarial science in mind, they provide only shallow understanding of these topics, and extensive outside study is needed to supplement them. I would also recommend taking any Risk Management and Insurance classes offered to gain insight into the insurance industry and risk management techniques, both of which are very important for the actuarial profession. Introduction to Risk Management and Insurance (FIS 200) is a great course for learning these basics, and FIS 304, 307, and 408 provide further insight if they are

offered. Finally, I would recommend any supplemental Economics courses that you are able to take.

To properly prepare yourself for a career in actuarial science, I would recommend completing at least two exams and one actuarial internship prior to graduation. Campus involvement and leadership positions are also very important to attain while you are at IWU. To sufficiently study for an actuarial exam, most people suggest a rough guide of studying 100 hours for each exam hour, i.e. you should study about 300 hours each for exam P/1 and exam FM/2, both of which are three hours long. For an exam where you are learning the majority of the material on your own, I would recommend purchasing a study manual (both ASM and Actex study manuals are highly regarded) and allowing yourself about three to four months to teach yourself the material and do the practice problems found in the manual. Alternatively, I have had good success with purchasing study packages from Coaching Actuaries, which include an electronic version of the ASM study manual, video lectures, video results to practice problems, and more resources. After you are finished with learning the material and completing practice problems, I suggest taking 2-4 weeks to review the material. After this, you should begin taking about one month worth of practice exams, which is in my opinion the best way to prepare yourself for the actual exam. Various companies sell practice exams, but I have had great success with ADAPT, which is an online testing software that simulates real exam settings at appropriate difficulty levels. ADAPT subscriptions can be purchased for varying lengths of time, and a six month subscription is included in the Coaching Actuaries packages.

To prepare for an exam where you have previously learned the material, such as exam P/1 if you have taken MATH 324 and MATH 325, I do not find purchasing the study manuals or Coaching Actuaries packages to be necessary. Instead, I would just recommend the usual 2-4 weeks of review followed by a month of practice exams (ADAPT if possible). To become a viable candidate for an actuarial internship I would recommend completing 1-2 actuarial exams, having strong extra-curricular and leadership experiences on your resume, and having at least a 3.5 for both your cumulative and major(s) GPAs. Previous non-actuarial internship experience, particularly in an insurance or business setting, is also advantageous to have but certainly is not necessary.

The hardest part of getting into actuarial science is committing yourself to the seemingly insurmountable amount of work that is needed to successfully pass the exams. However, if you possess strong mathematical abilities and an incredible work ethic, you should be up to the challenge. Do not be discouraged if it takes you two, three, or even four attempts to pass an exam; as mentioned before, each exam has roughly a 30-50% pass rate, and you are competing against some of the brightest mathematical minds in the country. To learn more about actuarial science, I advise visiting beanactuary.org. I have also found the Actuarial Outpost (actuarialoutpost.com) to be a useful resource for learning more about the field and getting answers to specific actuarial questions.