

## **Actuarial Studies within the Biometry and Statistics and Statistical Science majors**

An actuary is a business professional who analyzes the financial consequences of risk. Actuaries use mathematics, statistics and financial theory to study uncertain future events, especially those of concern to insurance and pension programs. They evaluate the likelihood of those events, design creative ways to reduce the likelihood and decrease the impact of adverse events that actually do occur. To be more specific, actuaries improve financial decision making by developing models to evaluate the current financial implications of uncertain future events.

Actuaries are an important part of the management team of the companies that employ them. Their work requires a combination of strong analytical skills, business knowledge and understanding of human behavior to design and manage programs that control risk.

No matter the source, actuary is consistently rated as one of the best jobs in America. *US News and World Report*, the *Jobs Rated Almanac*, *CNN Money*, and others all agree: few other occupations offer the combination of benefits that an actuarial career can offer. In almost every job satisfaction category, such as work environment, employment outlook, job security, growth opportunity, and salary (especially starting salary), a career as an actuary is hard to beat.

### **Required courses for the Biometry and Statistics and Statistical Science majors**

Calculus I and II: MATH 1110 & 1120

Multivariable Calculus and Linear Algebra: MATH 2210 & 2220 or 2230 & 2240 or 2930 & 2940 or 2130 & 2310

Statistical Methods I: BTRY 3010 or BTRY 6010 or equivalent

Statistical Methods II: BTRY 3020 or BTRY 6020

Probability: BTRY 3080, STSCI 3080, ECON 3130, or MATH 4710

Theory of Statistics: BTRY 4090, STSCI 4090, or MATH 4720

Statistical Computing: BTRY 3520

Linear Models: BTRY 4030

### **Elective courses**

Students in the Actuarial Studies concentration must take at least three advanced electives from the following list and one additional advanced statistics elective (which may also be from this list):

STSCI 4270: Introduction to Survival Analysis

STSCI 4550: Applied Time Series Analysis

AEM 2240/Econ 4220: Finance

AEM 4210/Econ 4240: Derivatives and Risk Management

### **Validation by Educational Experience (VEE) approved courses**

VEE courses are required toward achieving actuarial credentials. These courses may be satisfied through undergraduate coursework. It is strongly suggested by many in the field that these courses are completed prior to undergraduate graduation. Both CAS and SOA require completion with a

minimum grade of a B-. The courses cover 3 topics: Economics, Corporate Finance and Applied Statistical Methods. The following Cornell courses have been pre-approved by the CAS and SOA to be applied for VEE credit:

Economics: ECON 1110 & 1120 or ECON 3010 & 3020 combined by an econometrics course (ECON 3125, ORIE 4630, or ECON 6200)

Corporate Finance: AEM 2240 or ECON 4220

Applied Statistics: BTRY 3010-3020 or BTRY 6010-6020, BTRY 4030\*, STSCI 4270\*, ORIE 5550/STSCI 4550\*, ORIE 4740

\*Under review for VEE approval

## **Courses and Exams**

The preliminary exams are the common foundation for becoming an actuary. No matter which actuarial practice area a person decides to enter, future actuarial education will depend on mastery of the preliminary exams. Actuaries achieve professional status by passing a set of examinations prescribed by the Casualty Actuarial Society (CAS) or Society of Actuaries (SOA). Many prospective actuaries begin taking exams while in college with the aid of self-study courses and materials. Most achieve Associateship in three to five years. All students acquire a core set of knowledge from required courses before following the CAS or SOA career path.

### **Probability**

The Probability Exam is a three-hour multiple-choice examination. It is called [Exam P](#) by the Society of Actuaries and Exam 1 by the Casualty Actuarial Society. The syllabus for the Probability Exam develops the candidate's knowledge of the fundamental probability tools for quantitatively assessing risk. The application of these tools to problems encountered in actuarial science is emphasized. A thorough command of the supporting calculus is assumed. Additionally, a very basic knowledge of insurance and risk management is assumed.

### **Financial Economics**

The Financial Mathematics Exam is a three-hour multiple-choice examination. It is called [Exam FM](#) by the Society of Actuaries and Exam 2 by the Casualty Actuarial Society. The syllabus for the Financial Mathematics Exam develops the candidate's understanding of the fundamental concepts of financial mathematics and how those concepts are applied in calculating present and accumulated values for various streams of cash flows as a basis for future use in: reserving, valuation, pricing, asset/liability management, investment income, capital budgeting, and valuing contingent cash flows. The candidate will also be given an introduction to financial instruments, including derivatives, and the concept of arbitrage free as it relates to financial mathematics. A basic knowledge of calculus and an introductory knowledge of probability is assumed.

### **Models for Financial Economics**

The Models for Financial Economics Exam is a three-hour multiple-choice examination. It is called [Exam MFE](#) by the Society of Actuaries and Exam 3F by the Casualty Actuarial Society. The syllabus for the Models for Financial Economics Exam develops the candidate's knowledge of the theoretical basis of

certain actuarial models and the application of those models to insurance and other financial risks. A thorough knowledge of calculus, probability and interest theory is assumed. Knowledge of risk management at the level of Exam 1/P is also assumed.

### **Models for Life Contingencies**

The SOA and CAS each offer their own version of the life contingencies exam. SOA Life Contingencies Exam (called [Exam MLC](#)) is a three-hour multiple choice exam. CAS Life Contingencies and Statistics Exam (called Exam 3L) is a two-and-a-half-hour, multiple-choice exam. The syllabus for Exam MLC develops the candidate's knowledge of the theoretical basis of life contingent models and the application of those models to insurance and other financial risks." A thorough knowledge of calculus, probability and interest theory is assumed. Knowledge of risk management at the level of Exam P is also assumed.

### **Construction & Evaluation of Actuarial Models**

Exam C is a three and a half hour multiple-choice examination and is identical to Casualty Actuarial Society (CAS) Exam 4. The syllabus provides an introduction to modeling and covers important actuarial methods that are useful in modeling. A thorough knowledge of calculus and probability is assumed. The candidate will be introduced to useful frequency and severity models beyond those covered in Exam M. The candidate will be required to understand the steps involved in the modeling process and how to carry out these steps in solving business problems. The candidate should be able to: analyze data from an application in a business context; determine a suitable model including parameter values; and provide measures of confidence for decisions based upon the model.

### **Cornell classes suggested for the SOA/CAS exams**

Course	Exam P	Exam FM	Exam MFE	Exam MLC	Exam C
BTRY 3080/Math 4710	X				X
BTRY 4090/Math 4720					X
STSCI 4270				X	X
AEM 2240		X	X		
AEM 4210/Econ 4240		X	X		

P – Probability, FM – Financial Mathematics, MFE – Models for Financial Economics, C – Construction and Evaluation of Actuarial Models

### **Useful links**

Society of Actuaries (SOA): <http://www.soa.org/>

Casualty Actuarial Society: <http://www.casact.org/>

Actuarial Bookstore: <http://www.actuarialbookstore.com/>

Validation by Educational Experience: <http://www.soa.org/education/exam-req/edu-vee.aspx>