

## Actuarial Science

### Accounting

See Business Administration

### Actuarial Science (ACSC)

College of Arts and Sciences, Interdisciplinary Program  
O'Shaughnessy Science Hall (OSS) 201, (651) 962-5538  
Youn (MATH), director, Dayananda (MATH), Kemper (MATH), Shemyakin (MATH)

The Bachelor of Science in Actuarial Science is an interdisciplinary degree program offered through the Department of Mathematics. (See also the Department of Mathematics in this catalog.)

Actuarial science education equips students with strong mathematical problem-solving skills that can be applied to business careers. The major requirements consist of courses in mathematics, actuarial science, computer science, business, economics and a course in communication. Coupled with a firm foundation in the liberal arts, this major provides a sound grounding in analytical problem-solving and communication skills.

This program prepares students for a variety of careers with insurance companies, consulting firms, financial institutions, industrial corporations, or government agencies. It also provides a good preparation for non-actuarial careers in banking, finance, or insurance. In addition, the statistical background developed by an actuarial student is valuable in a variety of other fields.

Students graduating with a major in Actuarial Science will become proficient in basic mathematics through multivariate calculus and probability together with basic notions of insurance and risk management. They will demonstrate the ability to think clearly and critically in solving problems related to the analysis and management of risk. They will be able to effectively communicate technical and non-technical information to their peers and to non-specialists in their work environment.

To be certified as a Fellow or an Associate by either the Society of Actuaries or the Casualty Actuarial Society, one must pass a series of rigorous examinations. The earlier examinations are focused on mathematics and statistics and can be taken while a student. The later examinations cover aspects of business, economics, and the regulatory climate.

A careful selection of courses from a variety of departments helps a student to prepare for many excellent professional opportunities in this field. Students should see the director of the Actuarial Program for advice in selecting courses for a particular purpose.

Within the Department of Mathematics, the Center for Applied Mathematics provides opportunities for actuarial science students to work on significant mathematical problems of current interest to business, industry, and government.

**Admission Guideline:** Due to the demanding nature of the Actuarial Science Program and the difficulty of the examinations required for professional designation, it is strongly suggested that prospective majors have a minimum Math GPA of 3.0. Most students who have been successful in this program and actuarial examinations have had GPA's considerably higher than 3.0.

#### Major in Actuarial Science (B.S.)

ACCT 210 Introduction to Financial Accounting (4 credits)  
ACSC 264 Theory of Interest (4 credits)  
ACSC 320 Risk Management and Insurance (4 credits)  
ACSC 351 Foundations of Actuarial Mathematics (4 credits)  
ACSC 352 Actuarial Contingencies (4 credits)  
CISC 130 Introduction to Programming and Problem Solving in the Sciences (4 credits)  
ECON 252 Principles of Microeconomics (4 credits)  
FINC 321 Financial Management (4 credits)  
FINC 325 Investments (4 credits)  
MATH 113 Calculus I (4 credits)  
MATH 114 Calculus II (4 credits)  
MATH 200 Multi-Variable Calculus (4 credits)  
MATH 240 Linear Algebra (4 credits)  
MATH 313 Probability (4 credits)  
MATH 314 Mathematical Statistics (4 credits)

*Plus four credits from the following:*

ACSC 464 Mathematical Finance (4 credits)  
MATH 333 Applied Statistical Methods: Regression, Time Series, Forecasting (4 credits)  
MATH 385 Mathematical Methods of Numerical Analysis (4 credits)

*Plus four credits from the following:*

COJO 100 Public Speaking (4 credits)  
COJO 105 Communication in the Workplace (4 credits)  
ENGL 200 or above

*Suggested Electives:*

BLAW 301 Legal Environment of Business (4 credits)  
 CISC 230 Object-Oriented Design and Programming (4 credits)  
 CISC 450 Database Design I (4 credits)  
 ECON 251 Principles of Macroeconomics (4 credits)  
 ECON 351 Macroeconomic Theory (4 credits)  
 ECON 352 Microeconomic Theory (4 credits)  
 ECON 355 Game Theory (4 credits)  
 FINC 324 Advanced Financial Management (4 credits)  
 FINC 400-level Investment Courses (4 credits)  
 MBIS 701 Insurance Seminar (3 credits)  
 MKTG 300 Principles of Marketing (4 credits)

**Minor in Actuarial Science**

ACSC 264 Theory of Interest (4 credits)  
 ACSC 320 Risk Management and Insurance (4 credits)  
 MATH 113 Calculus I (4 credits)  
 MATH 114 Calculus II (4 credits)

*Plus eight credits from the following:*

*Note:* At least four credits must not satisfy the student's major field requirement (including allied requirements)

ACCT 210 Introduction to Financial Accounting (4 credits)  
 ACCT 215 Managerial Accounting (4 credits)  
 ACSC 351 Foundations of Actuarial Mathematics (4 credits)  
 ACSC 464 Mathematical Finance (4 credits)  
 ECON 252 Principles of Microeconomics (4 credits)  
 FINC 321 Financial Management (4 credits) *or* FINC 300 Finance for non-Business Majors (4 credits)  
 MATH 200 Multi-Variable Calculus (4 credits)  
 MATH 313 Probability (4 credits) *or* MATH 303 Statistics for the Applied Sciences (4 credits)

**ACSC 264 Theory of Interest (4 credits)**

A survey of topics in the mathematical analysis of financial transactions which involve payments made over time. Specific areas of concentration will include the time value of money, the analysis of annuities, amortization and sinking funds, and the pricing and rates of return on investments. Both continuous time and discrete time problems will be considered. **Offered spring semester.**

Prerequisite: MATH 114.

**ACSC 320 Risk Management and Insurance (4 credits)**

This course introduces students to the subjects of insurance—theory and practice—and corporate risk management. In addressing these subjects, students will receive exposure to risk theory, insurance pricing, contract analysis, insurance company operations, reinsurance, regulation and the concepts and principles of business risk management.

**Offered fall semester.**

Prerequisite: Junior standing or MATH 114

**ACSC 351 Foundations of Actuarial Mathematics (4 credits)**

The course covers the theory and applications of contingency mathematics in the area of life and health insurance, annuities and pensions from both the probabilistic and deterministic approaches. Topics will include: survival distributions, actuarial notation, life insurance and life annuities, net premiums and reserves. **Offered fall semester.**

Prerequisite: ACSC 264 and MATH 313.

**ACSC 352 Actuarial Contingencies (4 credits)**

Extension of the analysis of ACSC 351 to multiple life functions and multiple decrement theory. Topics will include: multiple life functions and multiple decrement models, valuation of pensions, insurance models including expenses, non-forfeiture benefits and dividends. **Offered spring semester.**

Prerequisite: ACSC 351

**ACSC 464 Mathematical Finance (4 credits)**

The focus of this course is on applications of probability, stochastic processes, and other mathematical tools to problems in finance. Both discrete and continuous models, including binomial, Brownian motion, and geometric Brownian motion models will be used to investigate the effects of randomness in financial markets and the behavior of financial instruments. The mathematical realization of arbitrage and hedging strategies will be examined, including the Arbitrage Theorem and the concept of risk-neutral pricing. Applications will include the pricing of equity options, currency transactions, and the use of duration and convexity in fixed income analysis. The course will be of interest to students of actuarial science, mathematics, finance and economics who want to develop a better quantitative understanding of financial risk. **Offered fall semester.**

Prerequisites: MATH 313 or MATH 303 and ACSC 264 or a course in FINC approved by the instructor