

# ACTUARIAL MATHEMATICS (AM)

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## Courses

### AM 230. Actuarial Statistics I. 3 Credit Hours.

This is the first course in probability and statistics for actuarial students. Topics include sample spaces, probability rules, counting techniques, Bayes rule, random variables, probability distributions and density functions, expected values and moment generating functions, and special probability distributions and densities.

Pre/Corequisites: MATH 223

Session Cycle: Fall, Spring

Yearly Cycle: Annual.

### AM 231. Actuarial Statistics II. 3 Credit Hours.

This course is a continuation of AM 230. Topics include transformation of variables; sampling distributions and order statistics, the central limit theorem; max likelihood estimates; method of moment estimates and hypothesis testing.

Prerequisites: MATH 223 and AM 230

Session Cycle: Fall, Spring

Yearly Cycle: Annual.

### AM 332. Actuarial Statistics III. 3 Credit Hours.

This course is an applied statistics course for actuaries. It covers the topics necessary for analysis of data. Topics include: Hypothesis testing, chi-square tests, Analysis of Variance, Simple and Multiple Regression, Time Series and Index Numbers.

Prerequisites: AM 231 or MATH 201

Session Cycle: Fall, Spring

Yearly Cycle: Annual.

### AM 333. Advanced Probability. 3 Credit Hours.

This course is devoted to the study of distribution classes and credibility. It is designed to prepare actuarial students for many of the topics covered in Exam STAM given by the Society of Actuaries. The topics of study include Risk Measures, Distribution Families, Coverage Modifications, Frequentist and Bayesian Estimation, and Credibility Theory. This course includes both theoretical analysis as well as applied problems that arise naturally in the insurance industry.

Prerequisites: AM 231

Session Cycle: Fall

Yearly Cycle: Annual.

### AM 340. Mathematical Interest Theory I. 3 Credit Hours.

This course includes the measurement of interest; accumulation and discount of money; present value of a future amount; forces of interest and discount; equations of value; investment return; inflation; annuities (simple and complex); perpetuities; amortization and sinking funds; yield rates; spot and forward rates; and bond pricing. This course is designed to help prepare the student for Exam FM.

Prerequisites: MATH 223

Session Cycle: Fall, Spring

Yearly Cycle: Annual.

### AM 341. Mathematics of Finance, Insurance, and Pensions. 3 Credit Hours.

This course will review the mathematics of basic compound interest for determining the future amounts and present values of single and periodic investments. Advanced topics in the mathematics of finance will include complex annuities of fixed periodic amounts, annuities where the periodic payment amount increases arithmetically and/or geometrically, bonds, including duration analyses, investment rates of return, both dollar- and time-weighted, and reverse mortgages. Topics in the mathematics of insurance will include the development of mortality tables and computation functions for the determination of the present and accumulated values of life annuities, premium determination, and settlement payment options. Topics in the mathematics of pensions will include the mathematics of social security, defined benefit and defined contribution pension plans. Students receiving credit for AM 340 or AM 421 will not receive credit for this course.

Prerequisites: MATH 110 or equivalent

Session Cycle: Fall

Yearly Cycle: Alternate Years.

### AM 342. Mathematical Interest Theory II. 3 Credit Hours.

This course, combined with Mathematical Interest Theory I, prepares students for Exam FM given by the Society of Actuaries. The topics cover fundamental actuarial theory as it pertains to interest and investments. This course includes mathematical valuation of securities and dividends; options, put-call parity, duration, evaluation and payoff and profit of derivative contracts, forwards, futures, and swaps. Additional topics include immunization and cash flows. This course not only helps the student prepare for Exam FM, but it also helps provide a cross-over in preparing for Exam IFM and 3F.

Prerequisites: AM 340

Session Cycle: Fall, Spring

Yearly Cycle: Annual.

### AM 391. Actuarial Math Internship. 3 Credit Hours.

Actuarial mathematic internships give students the opportunity for supervised employment in an area where they can apply actuarial mathematic theories and principles. Interns work at least ten hours a week, meet periodically with supervising faculty member, do research on their field of employment, and prepare a substantive report on work experience and research.

Prerequisites: Junior standing and approval by a supervising faculty member and the department chair.

### AM 393. Exam P Seminar. 2 Credit Hours.

The goal of this course is to help students synthesize content from AM 230 (and some content from AM 231) and apply that knowledge to solving actuarial problems such as those encountered in the context of Exam P. In addition this course will also develop students computational skills and tacit knowledge of problem-solving strategies needed to tackle these actuarial problems in an efficient manner. While additional study effort will be required, passing this course should put students on track for taking Exam P.

Pre/Corequisites: AM 231

Session Cycle: Spring

Yearly Cycle: Annual.

**AM 394. Exam FM Seminar. 2 Credit Hours.**

The goal of this course is to help students synthesize content from AM 340 (and some content from AM 342) and apply that knowledge to solving actuarial problems such as those encountered in the context of Exam FM. In addition this course will also develop students computational skills and tacit knowledge of problem-solving strategies needed to tackle these actuarial problems in an efficient manner. While additional study effort will be required, passing this class should put students on track for taking Exam FM.

Pre/Corequisites: AM 342

Session Cycle: Fall

Yearly Cycle: Annual.

**AM 421. Life Contingencies I. 3 Credit Hours.**

This course is a study of single life functions including the measurement of mortality; life annuities; life insurance; and net annual premiums. This course, in conjunction with AM 422, is designed to help prepare actuarial students for Exam LTAM given by the Society of Actuaries.

Prerequisites: AM 230 and AM 340

Session Cycle: Fall

Yearly Cycle: Annual.

**AM 422. Life Contingencies II. 3 Credit Hours.**

A continuation of AM 421, including net premium reserves; gross premium reserves including expenses; joint-life functions; contingent functions; compound contingent functions; reversionary annuities; and multiple decrement functions. The course provides a theoretical basis of contingent payment models and the application of those models to insurance and other financial risks. This course, in conjunction with AM 421, is designed to help prepare actuarial students for Exam LTAM given by the Society of Actuaries.

Prerequisites: AM 421

Session Cycle: Spring

Yearly Cycle: Annual.

**AM 440. Actuarial Mathematical Models and Stochastic Calculus. 3 Credit Hours.**

The primary goal of this course is to provide the student a background in the mathematics of stochastic processes, risk, and financial economics as it relates to actuarial models. The underlying foundation of this course is the mathematics and economics of the pricing of financial options. The course will cover the theoretical basis of corporate finance and financial models, and it will highlight the application of those models to insurance and other financial risks. Taking this course will make it possible for the student to prepare for the Society of Actuaries Exam IFM and the Casualty Actuarial Society Exam 3F.

Prerequisites: AM 342 or FIN 465

Session Cycle: Fall

Yearly Cycle: Annual.

**AM 451. Pension Fundamentals. 3 Credit Hours.**

This one-semester course is designed to introduce the student to the social security system of the United States and to various deferred compensation concepts including defined benefit, defined contribution, target benefit, and profit sharing pension plans. Both the accumulation and distribution of pension funds are discussed via annuities certain and life annuities. Appropriate aspects of the Internal Revenue Code which govern deferred compensation will be discussed.

Prerequisites: One of the following: MATH 129, AM 340 or AM 341 or FIN 312

Session Cycle: Fall

Yearly Cycle: Annual.

**AM 471. Fundamentals of Property and Casualty Reserving. 3 Credit Hours.**

The reserve for unpaid claim liabilities is a major item on the balance sheet of every property and casualty (P&C) insurer. Estimating this quantity is a core responsibility of actuaries. This course will cover basic mathematical and accounting concepts relating to reserving, the triangular loss development, deterministic reserve projection methods (e.g., loss-ratio and Bornhuetter-Ferguson techniques), common diagnostic statistics, characteristics of different US P&C lines of business, and GLM-based stochastic reserving methods, that utilize bootstrapping.

Prerequisites: AM 332

Session Cycle: Spring

Yearly Cycle: Annual.

**AM 481. Ratemaking. 3 Credit Hours.**

This course will cover the basic techniques of property and casualty ratemaking. Ratemaking is corefunction of actuaries, and is a necessary tool for satisfying an organization's strategic, operational, and regulatory goals and requirements. This course will cover much of the material on the ratemaking portion of the syllabus for Exam 5 of the Casualty Actuarial Society (CAS).

Prerequisites: AM 231 and AM 340 and junior standing

Session Cycle: Fall

Yearly Cycle: Annual.

**AM 492. Advanced Actuarial Mathematics Seminar Exam LTAM. 2 Credit Hours.**

The goal of this course is to help students synthesize content from the two life contingencies courses (AM 421 and AM 422), and apply that knowledge to solving actuarial problems such as those encountered in the context of the Society of Actuaries' Exam LTAM. In addition, this course will also develop the students' computational skills and tacit knowledge of problem-solving strategies needed to tackle these actuarial problems in an efficient manner. While additional study effort will be required, passing this course should put the student on track for taking Exam LTAM.

Pre/Corequisites: AM 422

Session Cycle: Varies

Yearly Cycle: Varies.

**AM 493. Advanced Actuarial Mathematics Seminar Exam STAM. 2 Credit Hours.**

The goal of this course is to help students synthesize content on probability and stochastic modeling topics from the following courses: AM 231, AM 332, and AM 333. The synthesized knowledge will be applied to solving actuarial problems such as those encountered in the context of Exam STAM. In addition this course will also develop your computational skills and tacit knowledge of problem solving strategies needed to tackle these actuarial problems in an efficient manner. While additional study effort will be required, passing this course should put students on track for taking Exam STAM.

Pre/Corequisites: AM 333

Session Cycle: Varies

Yearly Cycle: Varies.

**AM 494. Advanced Actuarial Exam Seminar IFM and 3F. 2 Credit Hours.**

The goal of this course is to help students synthesize content on options (AM 342 or FIN 481) and stochastic calculus (AM 440), and apply that knowledge to solving actuarial problems such as those encountered in the context of Exam IFM and 3F. In addition this course will also develop students computational skills and tacit knowledge of problem solving strategies needed to tackle these actuarial problems in an efficient manner. While additional study effort will be required, passing this course should put students on track for taking Exam IFM and 3F.

Pre/Corequisites: AM 440

Session Cycle: Varies

Yearly Cycle: Varies.