

# MATH 4260 Actuarial Mathematics I

**Course description:** Brief introduction to annuities certain, survival distributions and life tables, life insurance, life annuities, net premiums, net premium reserves. Intended to prepare students for actuarial examinations.

**Schedule:** Fall. 3 credit hours.

**Prerequisite:** C or better in MATH 4410 (Probability & Statistics I)

**Textbook:** Models for Quantifying Risk by Robin Cunningham, Thomas Herzog and Richard London, Actex (2005).

**General information:** The sequence MATH 4260-4270 covers the survival models and life contingencies topics tested on SOA/CAS Exam M/3, as well as some background material relevant to SOA/CAS Exams P/1 and C/4. The prerequisite MATH 4410 covers topics tested on SOA/CAS Exam P/1. The textbook exercises will be supplemented with sample questions from actuarial examinations.

**Calculators:** An approved calculator for the SOA/CAS examinations, TI-30Xa or TI-30X II, is recommended.

## Topics covered:

### Chapter 3 Claim Frequency Models

- 3.1 Discrete Distributions
- 3.2 Creation of Additional Counting Distributions
- 3.3 Counting Processes

### Chapter 4 Claim Severity Models

- 4.1 Fundamental Continuous Distributions
- 4.2 Generating New Distributions
- 4.3 Modifications of the Loss Random Variable
- 4.4 Empirical Loss Distributions

### Chapter 5 Survival Models

- 5.1 The Age-at-Failure Random Variable
- 5.2 Examples of Parametric Survival Models
- 5.3 The Time-to-Failure Random Variable
- 5.4 The Central Rate
- 5.5 Select Survival Models

### Chapter 6 The Life Table

- 6.1 Definition of the Life Table
- 6.2 The Traditional Form of the Life Table

- 6.3 Other Functions Derived from  $\ell_x$
- 6.4 Summary of Concepts and Notation
- 6.5 Methods for Non-Integral Ages

#### Chapter 9 Contingent Payment Models

- 9.1 Discrete Stochastic Models
- 9.2 Group Deterministic Approach
- 9.3 Continuous Stochastic Models
- 9.4 Contingent Payment Models with Varying Payments
- 9.5 Continuous and  $m^{thly}$  Functions Approximated from the Life Table
- 9.6 Miscellaneous Examples

#### Chapter 10 Contingent Annuity Models

- 10.1 Whole Life Annuity Models
- 10.2 Temporary Annuity Models
- 10.3 Deferred Whole Life Annuity Models
- 10.4 Contingent Annuities Payable  $m^{thly}$
- 10.5 Non-Level Payment Annuity Functions
- 10.6 Miscellaneous Examples

#### Chapter 11 Funding Plans for Contingent Contracts

- 11.1 Annual Funding Schemes for Contingent Payment Models
- 11.2 Random Variable Analysis
- 11.3 Continuous Payment Funding Schemes
- 11.4 Funding Schemes with  $m^{thly}$  Payments

#### Chapter 12 Contingent Contract Reserves

- 12.1 Reserves for Contingent Payment Models with Annual Payment Funding
- 12.2 Recursive Relationships for Discrete Models with Annual Premiums
- 12.3 Reserves for Contingent Payment Models with Continuous Payment Funding
- 12.4 Reserves for Contingent Payment Models with  $m^{thly}$  Payment Funding