

Curriculum for MTH 4451, Short-Term Insurance Mathematics

1. Introduction to Pricing

- Risk costing
- Technical premium calculation
- High-level pricing process

2. Insurance and Reinsurance Products

- Classification of general insurance products
- Products by category of cover
- Products by customer type

3. Basic distributional quantities

- Moments
- Percentiles
- Generating functions and sums of random variables
- Tails of distributions
- Measures of risk

4. Actuarial Models

- The role of parameters
- Continuous models
- Creating new distributions
- Selected distributions and their relationships
- The linear exponential family
- The Poisson distribution
- The negative binomial distribution
- The binomial distribution
- The $(a, b, 0)$ class
- Truncation and modification at zero

5. Frequency and severity with coverage modifications

- Deductibles
- The loss elimination ratio and the effect of inflation for ordinary deductibles
- Policy limits
- Coinsurance, deductibles, and limits
- The impact of deductibles on claim frequency

6. Aggregate loss models

- The compound model for aggregate claims
- Analytic results
- Computing the aggregate claims distribution
- The recursive method
- The impact of individual policy modifications on aggregate payments
- The individual risk model

7. Mathematical statistics

- Point estimation
- Interval estimation
- Tests of hypotheses

8. Estimation for complete data

- The empirical distribution for complete, individual data
- Empirical distributions for grouped data

9. Estimation for modified data

- Point estimation
- Means, variances, and interval estimation
- Kernel density models
- Approximations for large data sets

10. Risk Measures

- Uses
- Premium-based risk measures
- Capital-based risk measures

Course materials:

Nonlife Actuarial Models: Theory, Methods and Evaluation (International Series on Actuarial Science) First Edition, Tse, Y-K., Cambridge University Press, 2009.

Pricing in General Insurance, Parodi,P., Chapman & Hall CRC, 2014.

Instructor's notes published on Blackboard.

Evaluation: Homework, class participation, in-class exams, and a final exam. Students will work on homework in groups.