MANGALORE UNIVERSITY

DEPARTMENT OF STATISTICS

MSc STATISTICS

Soft Core	STS563: Risk and Ruin Models in Insurance	No. of credits : 3

Course Outcomes:

CO1: Describe and calculate a range of measures of investment risk, and how insurance companies reduce risk.

CO2: Describe and utilise compound Poisson processes to calculate the probability of ruin for a variety of insurance portfolios.

CO3: Describe and utilise run-off triangle methods for valuing insurance liabilities.

CO4: Describe and demonstrate knowledge and understanding of models for credit risk.

Unit 1

An introduction to nonlife insurance, examples. Utility theory**,** Utility functions, the expected utility criterion. Risk averse and risk loving, risk aversion coefficient, Classes of utility functions.Principles of premium calculation, expected value principle, principle of zero utility, risk adjusted premium principle. (10 hrs)

Unit 2

Individual risk model for short time, the collective risk model for single period - Compound Poisson distribution, distribution of aggregate claim S, moments of S. The effect of reinsurance, Recursive calculation of aggregate claims distributions, Panjer recursion formula, Extensions of the Panjer recursion formula, The application of recursion formulae, approximate calculation of aggregate claims distributions. (14 hrs)

Unit 3

Ruin theory - Ruin, ruin time, ruin probability. A discrete time risk model, the probability of ultimate ruin, the probability of ruin in finite time, continuous time surplus models, compound Poission process as a model for aggregate claim. The adjustment coefficient, Lunberg inequality. Survival probabilities, Laplace transformation, Approximations of aggregate claims. Surplus below

the initial level, the maximal aggregate loss and its distribution. Analysis of reinsurance using ruin theory. (16 hrs)

References

1. David C. M. Dickson (2005) "Insurance Risk and Ruin" Cambridge University Press.
2. Thomas Mikosch (2006), "Non-Life Insurance Mathematics -An Introduction with Stochastic Processes", Springer.
3. N.L. Bowers, H.U. Gerber, J.C. Hickman, D.A. Jones and C.J. Nesbitt (1997), "Actuarial Mathematics", Second Edition, The Society of Actuaries.
4. Alexander J. McNeil, Rüdiger Frey, Paul Embrechts (2005), "Quantitative Risk Management: Concepts, Techniques, and Tools", Princeton University Press.