

Subject Description Form

Subject Code	AMA531
Subject Title	Loss Models and Risk Analysis
Credit Value	3
Level	5
Pre-requisite/ Co-requisite/ Exclusion	Pre-requisite: AMA529 Statistical Inference
Objectives	To enable students to have a thorough understanding of insurance loss distributions, their variations and their applications to insurance policies.
Intended Learning Outcomes	<p>Upon completion of the subject, students will be able to:</p> <ul style="list-style-type: none"> (a) Apply the concepts and terminology of actuarial loss models and risk analysis. (b) Calculate parametric and nonparametric estimators of a loss distribution. (c) Integrate the knowledge and techniques in statistical inference, probability models and risk theory to analyze complete and incomplete insurance data. (d) Apply statistical tests to determine the suitability of a fitted model. (e) Make statistical inferences based on the knowledge and techniques in estimation, evaluation, and selection of loss models. (f) Apply parametric and semiparametric models and inference procedures to analyze loss data.
Subject Synopsis/ Indicative Syllabus	<p>Complete and incomplete insurance data: complete, censored, truncated, grouped and shifted data; estimation adjustments based on the presentation of the sample data.</p> <p>Parametric estimation of a failure time or loss distribution: method of moments, percentile matching, maximum likelihood, and Bayesian estimation.</p> <p>Nonparametric estimation of a failure time or loss distribution: the empirical distribution, the Kaplan-Meier estimator and the Nelson-Aalen estimator.</p> <p>Properties of estimators: efficiency, bias, consistency, and mean squared error.</p> <p>Variance and confidence intervals of estimators: method for empirical distributions, information matrix and the delta method.</p> <p>Statistical tests to determine the suitability of a fitted model: Kolmogorov-Smirnov test, Pearson's chi-square statistic, likelihood ratio test, Bayesian Schwarz Criterion.</p> <p>Models with covariates: Cox proportional hazard models, parametric and semiparametric models, generalized linear models; likelihood and partial likelihood methods.</p> <p>Insurance applications.</p>

Teaching/Learning Methodology	The subject will be delivered mainly through lectures and tutorials. The teaching and learning approach is mainly problem-solving oriented. The approach aims at the development of mathematical techniques and how the techniques can be applied to solving problems. Students are encouraged to adopt a deep study approach by employing high level cognitive strategies, such as critical and evaluative thinking, relating, integrating and applying theories to practice.																																																				
Assessment Methods in Alignment with Intended Learning Outcomes	<table border="1"> <thead> <tr> <th rowspan="2">Specific assessment methods/tasks</th> <th rowspan="2">% weighting</th> <th colspan="6">Intended subject learning outcomes to be assessed (Please tick as appropriate)</th> </tr> <tr> <th>a</th> <th>b</th> <th>c</th> <th>d</th> <th>e</th> <th>f</th> </tr> </thead> <tbody> <tr> <td>1. Assignments</td> <td>12%</td> <td>✓</td> <td>✓</td> <td>✓</td> <td>✓</td> <td>✓</td> <td>✓</td> </tr> <tr> <td>2. Mid-term test</td> <td>28%</td> <td>✓</td> <td>✓</td> <td>✓</td> <td></td> <td></td> <td></td> </tr> <tr> <td>3. Examination</td> <td>60%</td> <td>✓</td> <td>✓</td> <td>✓</td> <td>✓</td> <td>✓</td> <td>✓</td> </tr> <tr> <td>Total</td> <td>100 %</td> <td colspan="6"></td> </tr> </tbody> </table> <p>Continuous Assessment comprises of assignments and tests. A written examination is held at the end of the semester.</p>							Specific assessment methods/tasks	% weighting	Intended subject learning outcomes to be assessed (Please tick as appropriate)						a	b	c	d	e	f	1. Assignments	12%	✓	✓	✓	✓	✓	✓	2. Mid-term test	28%	✓	✓	✓				3. Examination	60%	✓	✓	✓	✓	✓	✓	Total	100 %						
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▪ Lecture				26 Hrs.																																																	
▪ Tutorial				13 Hrs.																																																	
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▪ Assignment/Mini-project				35 Hrs.																																																	
▪ Self-study				63 Hrs.																																																	
Total student study effort				137 Hrs.																																																	
Reading List and References	Klugman, S.A., Panjer, H.H., and Willmot, G.E. London, D. Maller, R.A. and Zhou, X. Smith, P.J.	Loss Models: From Data to Decision, 5th Edition Survival Models and Their Estimation, 3rd Edition Survival Analysis with Long-term Survivors Analysis of Failure and Survival Data	Wiley, 2018 ACTEX Publications, 1997 John Wiley & Sons, 1996 Chapman & Hall, 2002																																																		