

Subject Description Form

Subject Code	AMA514A
Subject Title	Applied Linear Models
Credit Value	3
Level	5
Pre-requisite/ Co-requisite/ Exclusion	Nil
Objectives	To enable students to have a thorough understanding of the methods of regression analysis and diagnostics. Emphasis will be laid on the applications and the principles underlying the linear statistical models.
Intended Learning Outcomes	<p>Upon completion of the subject, students will be able to:</p> <ul style="list-style-type: none"> (a) Describe the purpose of exploratory data analysis. Use appropriate tools to calculate suitable summary statistics and undertake exploratory data visualizations. (b) Understand linear relationships between variables using correlation analysis and regression analysis. Use R/SAS to fit a single or multiple linear regression model to a data set and interpret the output. (c) Understand the fundamental concepts of the generalized linear model (GLM), and describe how a GLM may be applied in actuarial pricing/reserving. Use R/SAS to fit a GLM to a data set and interpret the output. (d) Estimate regression parameters and perform diagnostic tests including checking assumption and evaluating model fit. (e) Use R/SAS to fit a statistical distribution to a data set and calculate appropriate goodness of fit measures. (f) Use Principle Components analysis to reduce the dimensionality of a complex dataset.
Subject Synopsis/ Indicative Syllabus	<p>Simple linear regression--model and assumptions; least squares estimation of parameters; inference on the parameters; coefficient of determination; confidence interval for the mean value of the response variable; prediction interval; test for lack of fit; examination of residuals.</p> <p>Multiple linear regression model: as an extension of the simple linear regression model; as a special case of the general linear model such as logistic and probit models; inference on the parameters; partial F-tests; polynomial regression; fixed-effects and random-effects model; use of indicator variables; multicollinearity; ridge regression; principal component regression.</p> <p>Diagnostics: analysis of variance and ANOVA table; one-way classification, partitioning of the total sum of squares and the degrees of freedom; expectations of mean squares, estimation of the overall mean and components of variance, regression approaches to ANOVA; heteroscedasticity; detection of heteroscedasticity; consequences of heteroscedasticity; solution to heteroscedasticity; generalized least squares, weighted least squares.</p> <p>Dimension reduction: selection of "independent" variables in regression; selection criteria; the methods of all regressions, backward elimination, forward selection and stepwise regression; principal component analysis.</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/statistical 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>15%</td> <td>✓</td> <td>✓</td> <td>✓</td> <td>✓</td> <td>✓</td> <td>✓</td> </tr> <tr> <td>2. Mid-term tests</td> <td>25%</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	15%	✓	✓	✓	✓	✓	✓	2. Mid-term tests	25%	✓	✓		✓	✓		3. Examination	60%	✓	✓	✓	✓	✓	✓	Total	100 %																								
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