

Subject Description Form

Subject Code	AMA514
Subject Title	Applied Linear Models
Credit Value	3
Level	5
Pre-requisite/ Co-requisite/ Exclusion	Nil
Objectives	The aim of this subject is to enable the 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) Formulate regression problems by identifying the appropriate model for the problem. (b) Perform least squares estimation and statistical inferences on regression model built. (c) Perform variable selection and problems diagnosis in least squares regression models. (d) Understand the principle of Analysis of Variance in comparing equality of several means. (e) Apply the technique of Analysis of Variance approach to analyze real life problems. (f) Develop the competence in the use of appropriate statistical packages/commercial software to solve Analysis of Variance problems and Linear Least Squares Regression problems.
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 and as a special case of the general linear model; inference on the parameters; partial F-tests; polynomial regression. Use of indicator variables.</p> <p>Selection of "independent" variables in regression; selection criteria; the methods of all regressions, backward elimination, forward selection and stepwise regression.</p> <p>Analysis of variance; one-way classification, partitioning of the total sum of squares and the degrees of freedom; ANOVA table; fixed-effects model and random-effects model; expectations of mean squares, estimation of the overall mean and components of variance. Regression approach to ANOVA.</p>

	<p>Heteroscedasticity; detection of heteroscedasticity, consequences of heteroscedasticity, solution to heteroscedasticity. Generalized least squares, weighted least squares. Autocorrelation; Durbin-Watson test, estimation procedures with autocorrelated errors, ARCH models and serial correlation.</p> <p>Multicollinearity; consequences of multicollinearity, measures of multicollinearity, solutions to multicollinearity, ridge regression, principal component regression, other solutions.</p>																																																																							
Teaching/Learning Methodology	<p>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.</p>																																																																							
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>10%</td> <td>✓</td> <td>✓</td> <td>✓</td> <td>✓</td> <td>✓</td> <td>✓</td> </tr> <tr> <td>2. Tests</td> <td>30%</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	10%	✓	✓	✓	✓	✓	✓	2. Tests	30%	✓	✓	✓	✓	✓		3. Examination	60%	✓	✓	✓	✓	✓		Total	100 %																								
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Reading List and References	Montgomery, D.C., Peck, E.A., and Vining, G.G.	Introduction to Linear Regression Analysis, 5th Edition	Wiley 2012
	Weisberg, S.	Applied Linear Regression, 4th Edition	Wiley 2014
	Littell, R.C., Stroup, W.W., and Freund, R.J.	SAS for Linear Models. 4th Edition	SAS 2002
	Faraway, J.J.	Linear Models with R. 2nd Edition	Chapman & Hall/CRC 2004
	Draper, N.R. and Smith, H.	Applied Regression Analysis, 3rd Edition	Wiley, 1998