

Subject Description Form

Subject Code	AMA2631
Subject Title	Applied Statistical Methods
Credit Value	3
Level	2
Pre-requisite/ Co-requisite/ Exclusion	Co-requisite: Probability and Distributions (AMA2691) Exclusion: Applied Statistical Methods (AMA263)
Objectives	This subject is to provide students with an overview of the Linear Model approach (regression analysis) and the Sum of Squares approach (analysis of variance) to analyze data. To enable students to have a thorough understanding of the methods of regression analysis as one of the most widely used statistical techniques for analyzing data. To help students to develop their ability to analyze the practical problems with the use of computer statistical packages such as MINITAB and SPSS, as well as commercial software EXCEL.
Intended Learning Outcomes	<p>Upon satisfactory completion of the subject, students should be able to:</p> <ol style="list-style-type: none"> 1. gain a basic knowledge and understanding of the Analysis of Variance (ANOVA) approach to analyze data, and the assumptions behind ANOVA; 2. identify and describe Fixed-effects Model and Random-effects Model when dealing with One-Factor ANOVA problems; 3. analyze and report results of ANOVA problems and assess their significance; 4. formulate and tackle Simple/Multiple Linear Regression problems so as to identify the appropriate model for the problems, to perform variables selection, estimation and inference on the parameters of the regression model built, and to diagnose if any problems arise due to violation of assumptions of Least Square Regression models; 5. develop the competence in the use of appropriate statistical packages/commercial software for the analysis of data using Univariate ANOVA and Linear Least Squares Regression approaches; 6. manage their own learning and to make use of appropriate texts, learning materials and relevant web-sites; 7. communicate effectively in a well-structured manner and build up an open-minded attitude; 8. know the importance in handling statistical data in a trustworthy manner.
Subject Synopsis/ Indicative Syllabus	<p><i>Ethics in Statistics</i></p> <p><i>Simple linear regression</i> 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><i>Multiple linear regression models</i> An extension of the simple linear regression model and as a special case of the general linear model $y = X\beta + \varepsilon$; estimation and inference on the parameters; partial F-tests; polynomial regression.</p>

	<p><i>Variable Selection and Model Building</i> Selection of independent variables; criteria for subset regression; the methods of all regressions, backward elimination, forward selection and stepwise regression.</p> <p><i>Indicator Variables</i> Concept of indicator variables; use of indicator variables.</p> <p><i>Multicollinearity</i> The problem of multicollinearity; multicollinearity diagnostics; solutions to multicollinearity.</p> <p><i>Autocorrelation</i> Sources and effects of autocorrelation; detecting the presence of autocorrelation; parameter estimation procedures with autocorrelated errors.</p> <p><i>Analysis of variance</i> 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>Teaching/Learning Methodology</p>	<p>The subject will be delivered mainly through lectures and tutorials. The lectures will be conducted to introduce the elements of applied statistical methods in the syllabus, which are then reinforced by learning activities involving demonstration, tutorial exercise and computer assignments.</p>																																																										
<p>Assessment Methods in Alignment with Intended Learning Outcomes</p>	<table border="1"> <thead> <tr> <th rowspan="2">Specific assessment methods</th> <th rowspan="2">% weighting</th> <th colspan="8">Intended subject learning outcomes to be assessed (Please tick as appropriate)</th> </tr> <tr> <th>1</th> <th>2</th> <th>3</th> <th>4</th> <th>5</th> <th>6</th> <th>7</th> <th>8</th> </tr> </thead> <tbody> <tr> <td>a. Computer Assignments</td> <td>20%</td> <td>✓</td> <td></td> <td>✓</td> <td></td> <td>✓</td> <td>✓</td> <td>✓</td> <td></td> </tr> <tr> <td>b. Tests</td> <td>20%</td> <td>✓</td> <td>✓</td> <td>✓</td> <td>✓</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>c. Examination</td> <td>60%</td> <td>✓</td> <td>✓</td> <td>✓</td> <td>✓</td> <td></td> <td></td> <td></td> <td>✓</td> </tr> <tr> <td>Total</td> <td>100 %</td> <td colspan="8"></td> </tr> </tbody> </table> <p>Continuous Assessment comprises of tests and computer assignments with real data. A written examination is held at the end of the semester.</p> <p>To pass this subject, students are required to obtain Grade D or above in both the Continuous Assessment and the Examination components in order to satisfy all the intended learning outcomes.</p>	Specific assessment methods	% weighting	Intended subject learning outcomes to be assessed (Please tick as appropriate)								1	2	3	4	5	6	7	8	a. Computer Assignments	20%	✓		✓		✓	✓	✓		b. Tests	20%	✓	✓	✓	✓					c. Examination	60%	✓	✓	✓	✓				✓	Total	100 %								
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Student Study Effort Required	Class contact:	
	▪ Lecture	28 Hrs.
	▪ Tutorial	14 Hrs.
	Other student study effort:	
	▪ Assignment	33 Hrs.
	▪ Self-study	33 Hrs.
	Total student study effort	108 Hrs.
Reading List and References	<u>Textbook:</u>	
	Kutner, M.H., Nachtsheim, C.J., Neter, J, & Li, W.	Applied Linear Statistical Models 5 th edition McGraw Hill 2005
	<u>References:</u>	
	Bowerman, B.L. & O'Connell, R.T.	Linear Statistical Models, an applied approach 2 nd edition Duxbury Press 2000
	Montgomery, D.C., Peck, E.A.& Vining, G.G.	Introduction to Linear Regression Analysis 3 rd edition Wiley-Interscience 2001
Dretzke, B.J.	Statistics with Microsoft Excel 4 th edition Prentice Hall 2008	