Subject Description Form

Subject Code	AMA3602
Subject Title	Applied Linear Models
Credit Value	3
Level	3
Pre-requisite	Introduction to Statistics for Business (AMA1501) or Introduction to Statistics (AMA1502/AMA2602) or Introduction to Statistics (AMA2634) **and** Calculus and Linear Algebra (AMA1007) or Linear Algebra (AMA1751) or Basic Mathematics II - Calculus and Linear algebra (AMA1120) or Intermediate Calculus and Linear Algebra (AMA2007/AMA2707) or Mathematics I (AMA2111)
Exclusion	Applied Statistical Methods (AMA2631/AMA2631A) Applied Linear Models for Finance Analytics (AMA2602)
Objectives	This subject is to provide students with an overview of linear models and their applications to finance analytics, to understand the principles and assumptions behind linear models, and enable students to perform linear regression analyses on real financial data using statistical software, such as R.
Intended Learning Outcomes	Upon satisfactory completion of the subject, students should be able to: a. gain a basic understanding of the Analysis of Variance (ANOVA) approach and its underlying assumptions; b. report and interpret results of ANOVA analyses; c. formulate and tackle simple/multiple linear regression problems so as to identify appropriate models for given problems, to perform variable selection, estimation and inference on regression parameters, and to perform model diagnosis; d. describe the fixed-effects model and random-effects model and explain their differences; e. develop the competence in the use of appropriate statistical software for the ANOVA and linear regression analyses for problems in finance; f. manage their own learning and make use of appropriate texts, learning materials and relevant websites; g. communicate effectively in a well-structured manner and build up an open-minded attitude; h. recognize the ethical and social responsibility of data analytics professionals.
Subject Synopsis/ Indicative Syllabus	*Analysis of variance* The ANOVA table; degrees of freedom; partitioning the sum of squares; the F-

distribution; expectations of mean squares; the F-test for the global null hypothesis. Applications to finance analytics.

Simple linear regression
Model specification and assumptions; least squares estimation of parameters; inference on model parameters; coefficient of determination; confidence interval for the mean value of the response variable; prediction interval; test for lack of fit; examination of residuals. Applications to finance analytics.

Multiple linear regression
Model specification and assumptions; estimation and inference on the parameters; partial F-tests; polynomial regression; indicator variables for categorical independent variables. Applications to finance analytics, such as the Fama-French three-factor model.

Model selection
Information criteria: Akaike information criterion; Bayesian information criterion. Stepwise model selection.

Multicollinearity
The problem of multicollinearity; multicollinearity diagnostics; ridge regression and other solutions to multicollinearity.

Random effects model
Correlated observations; within groups and between groups sum of squares; maximum likelihood estimation;

Ethics in Statistics

Teaching/Learning Methodology	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.

Assessment Methods in Alignment with Intended Learning Outcomes

Specific assessment methods	% weighting	Intended subject learning outcomes to be assessed (Please tick as appropriate)							
		a	b	c	d	e	f	g	h
1. Computer Assignments	20%	✓	✓	✓	✓	✓	✓	✓	
2. Test	20%	✓	✓	✓	✓				
3. Examination	60%	✓	✓	✓	✓				✓
Total	100 %								

Explanation of the appropriateness of the assessment methods in assessing the intended learning outcomes:

	The subject focuses on knowledge, skill and understanding of **Applied Statistical Methods**, thus, **Exam-based assessment** is the most appropriate assessment method, including 20% test and 60% examination. Moreover, 20% worth of computer assignments are included as a component of continuous assessment so as to keep the students in progress. Continuous Assessment comprises of tests and computer assignments with real data. A written examination is held at the end of the semester.	
Student Study Effort Expected	Class contact:	
	▪ Lecture	26 Hrs.
	▪ Tutorial	13 Hrs.
	Other student study effort:	
	▪ Assignment	33 Hrs.
	▪ Self-study	33 Hrs.
	Total student study effort	105 Hrs.
Reading List and References	Textbook:	
	Kutner, M.H., Nachtsheim, C.J., Neter, J, & Li, W. Applied Linear Statistical Models 5th edition McGraw Hill 2005	
	References:	
	Bowerman, B.L. & O'Connell, R.T. Linear Statistical Models, an Applied Approach 2nd edition Duxbury Press 2000	
	Montgomery, D.C., Peck, E.A.& Vining, G.G. Introduction to Linear Regression Analysis 5rd edition Wiley-Interscience 2012	
	Sclove, S. L. A Course on Statistics for Finance 1st edition CRC Press 2012	