

## Subject Description Form

<b>Subject Code</b>	AMA3631
<b>Subject Title</b>	Statistics for Data Science
<b>Credit Value</b>	3
<b>Level</b>	3
<b>Pre-requisite</b>	Probability & Distribution (AMA2691) or equivalent
<b>Objectives</b>	This subject is to introduce to the students the compilation of statistical data and foundational statistical inferential methods. It aims to help students to meet the challenges when applying classical ideas to modern data science.
<b>Intended Learning Outcomes</b>	<p>Upon completion of the subject, students will be able to:</p> <ol style="list-style-type: none"> <li>a) Apply the knowledge of basic statistics to the organization and interpretation of data;</li> <li>b) Understand the role of a parameter in a statistical model;</li> <li>c) Use data to estimate and evaluate uncertainty about the parameters;</li> <li>d) Find confidence intervals for the sample means, sample variances and sample proportions;</li> <li>e) Discuss the concept of Type I and Type II error, one-sided and two sided tests;</li> <li>f) Formulate statistical methods to the hypothesis testing to statistical problems;</li> <li>g) Recognize the ethical responsibility of data analysis</li> </ol>
<b>Subject Synopsis/ Indicative Syllabus</b>	<p><i>Ethics in Statistics</i> Professionalism, responsibilities, obligations, roles.</p> <p><i>Useful Distributions in Statistical Inference</i> Definitions of normal, t, F and chi-square distributions; familiarization with the relationships between these distributions and the use of corresponding tables.</p> <p><i>Estimation of Parameters</i> Statistic, unbiased estimator, mean square error (MSE), relative efficiency, uniformly minimum variance unbiased estimator. Sufficiency, factorization theorem. Fisher information matrix. Cramér-Rao lower bound, efficiency, efficient estimator, completeness. Point and interval estimates of a mean and the difference between two means, a proportion and the difference between two proportions, a variance and the ratio of two variances. Method of moments and Maximum Likelihood. Sample size required for a specified precision in an estimate.</p> <p><i>Test of Hypotheses</i> Formulation of statistical hypotheses and classical methods of forming tests. Type I and type II errors, power. One-sided and two-sided tests. Tests of</p>

	<p>significance; levels of significance; test statistics; critical regions. Tests for an assumed mean, the difference between two means, an assumed proportion, the difference between two proportions, an assumed variance, and the ratio of two variances. The use of chi-square tests for goodness of fit and for independence; contingency tables. Neyman-Pearson method. Generalized likelihood ratio test.</p> <p><i>Confidence intervals and sets</i> Random intervals and sets. Use of pivotal quantities. Relationship between tests and confidence intervals.</p>																																																														
<p><b>Teaching/Learning Methodology</b></p>	<p>The subject will be delivered mainly through lectures and tutorials. The lectures will be conducted to introduce the basic statistics concepts of the topics in the syllabus, which are then reinforced by learning activities including demonstration, tutorial exercise and assignments.</p>																																																														
<p><b>Assessment Methods in Alignment with Intended Learning Outcomes</b></p>	<table border="1"> <thead> <tr> <th>Specific assessment methods/tasks</th> <th>% weighting</th> <th colspan="7">Intended subject learning outcomes to be assessed (Please tick as appropriate)</th> </tr> <tr> <td></td> <td></td> <th>a</th> <th>b</th> <th>c</th> <th>d</th> <th>e</th> <th>f</th> <th>g</th> </tr> </thead> <tbody> <tr> <td>1. Assignments / Quizzes</td> <td>20%</td> <td>✓</td> <td>✓</td> <td>✓</td> <td>✓</td> <td>✓</td> <td>✓</td> <td>✓</td> </tr> <tr> <td>2. Tests</td> <td>20%</td> <td>✓</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> <td></td> </tr> <tr> <td>Total</td> <td>100 %</td> <td colspan="7"></td> </tr> </tbody> </table> <p>Explanation of the appropriateness of the assessment methods in assessing the intended learning outcomes: The subject focuses on knowledge, skill and understanding of <b>Statistics</b>, thus, <b>Exam-based assessment</b> is the most appropriate assessment method, including 20% test and 60% examination. Moreover, 20% worth of individual assignments and quizzes are included as a component of continuous assessment so as to keep the students in progress.</p> <p>Continuous Assessment comprises of assignments and/or quizzes, 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	g	1. Assignments / Quizzes	20%	✓	✓	✓	✓	✓	✓	✓	2. Tests	20%	✓	✓	✓					3. Examination	60%	✓	✓	✓	✓	✓	✓		Total	100 %							
Specific assessment methods/tasks	% weighting	Intended subject learning outcomes to be assessed (Please tick as appropriate)																																																													
		a	b	c	d	e	f	g																																																							
1. Assignments / Quizzes	20%	✓	✓	✓	✓	✓	✓	✓																																																							
2. Tests	20%	✓	✓	✓																																																											
3. Examination	60%	✓	✓	✓	✓	✓	✓																																																								
Total	100 %																																																														
<p><b>Student Study Effort Expected</b></p>	<table border="1"> <tr> <td>Class contact:</td> <td colspan="8"></td> </tr> <tr> <td> <ul style="list-style-type: none"> <li>• Lecture</li> </ul> </td> <td colspan="8">26 Hrs.</td> </tr> <tr> <td> <ul style="list-style-type: none"> <li>• Tutorial</li> </ul> </td> <td colspan="8">13 Hrs.</td> </tr> <tr> <td>Other student study effort:</td> <td colspan="8"></td> </tr> <tr> <td>Assignment</td> <td colspan="8">26 Hrs.</td> </tr> </table>									Class contact:									<ul style="list-style-type: none"> <li>• Lecture</li> </ul>	26 Hrs.								<ul style="list-style-type: none"> <li>• Tutorial</li> </ul>	13 Hrs.								Other student study effort:									Assignment	26 Hrs.																
Class contact:																																																															
<ul style="list-style-type: none"> <li>• Lecture</li> </ul>	26 Hrs.																																																														
<ul style="list-style-type: none"> <li>• Tutorial</li> </ul>	13 Hrs.																																																														
Other student study effort:																																																															
Assignment	26 Hrs.																																																														

	<ul style="list-style-type: none"> <li>• Self-study</li> </ul>	40 Hrs.
	Total student study effort:	105 Hrs.
<b>Reading List and References</b>	Textbook: Wackerly, D .D.,                    Mathematical Statistics with                    Duxbury Press Mendenhall, W., &                    Applications 7th edition                    2007 Scheaffer, R.L. References: Hogg, R.V., McKean,                    Introduction to Mathematical                    Prentice Hall 2012 J.W., & Craig, A. T.                    Statistics 7th edition	