

Lingnan University
Course Syllabus

Course Title	:	Probability and Statistics 1
Course Code	:	CDS1003
Recommended Study Year	:	1
No. of Credits/Term	:	3
Mode of Tuition	:	Sectional Approach
Class Contact Hours	:	3 hours per week
Category in Major Prog.	:	Required
Prerequisite(s)	:	Nil
Co-requisite	:	Nil
Note	:	Students should (a) take CDS1002 Calculus previously, or (b) take both this course and CDS1002 Calculus in the same term
Exclusion	:	Nil
Exemption Requirement	:	Nil

Brief Course Description:

Probability and Statistics are fundamentals of quantitative analysis. This course introduces the basic theory of probability and statistics to students. It provides a strong mathematical background for students to understand the quantitative techniques used in the analysis of practical problems across different disciplines. Emphasis is placed on the underlying mathematical theories of probability and statistics. The topics covered include descriptive statistics, basic probability, probability distributions, correlation and the use of statistical software for data science.

Aims:

The aim is to provide a solid knowledge in probability and statistics for students in the Data Science programme. The student will be exposed to many kinds of statistical information. They will need to be able to collect, analyze, make use of and communicate these statistical information.

Learning Outcomes (LOs):

On completion of this course, students will be able to:

1. Identify the use of probability and statistics in various disciplines;
2. Identify the essential basic in probability and statistical theory;
3. Analyse probability and statistical problems using statistical software.

Indicative Contents:

Descriptive Statistics

Data, Data presentation, central tendency, variability and shape of data.

Probability

Basic concepts, counting rules, conditional probabilities, Bayes' Theorem.

Probability Distributions

Random variables, properties of probability distribution, Mathematical Expectation.

Discrete Distributions

Binomial distribution, Poisson distribution, Negative binomial distribution.

Continuous Distributions

Probability density functions, Uniform distribution, Exponential distribution, Gamma distribution, Chi-Square distribution, Normal distribution.

Bivariate Distributions

Correlation coefficient, Conditional distribution.

Moment Generating Functions

Moment generating functions for rectangular, Binomial, Poisson, Normal and chi-square distribution.

Properties of moment generating functions.

Sampling and sampling distribution

Normal distribution and Central Limit Theorem

Statistical Software Package

General features and operation.

Teaching Method:

Basic concepts are discussed during class; theories are explained in terms of practical examples; Laboratory sessions are used to introduce computer software.

Assessment:

Assignments	20%
Mid-term Test	20%
Examination	60%
Total	100%

Measurement of Learning Outcomes:

1. Questions require conceptual understanding, data based analysis and case study are covered in the assignments. (LOs 1 – 3)
2. Questions require conceptual understanding and applications are assessed in both mid-term test and examination. (LOs 1 – 3)

Required/Essential Readings:

1. Hogg, R. and Tanis, E., *Probability and Statistical Inference: Global Edition 9th ed.*, Pearson (Intl), 2015.

Recommended/Supplementary Readings:

1. Black, K., *Business Statistics: For Contemporary Decision Making*, 7thed. Wiley, 2012.
2. DeGroot, M. and Schervish, M., *Probability and Statistics: Pearson New International Edition*, 4th ed., Pearson (Intl), 2013.
3. Donald, L.H. and Horrell, J.F., *Data, Statistics, and Decision Models with Excel*, John Wiley & Sons, Inc. 1998.
4. Levine, M., Szabat, K. A. & Stephan D. F., *Business Statistics – A First Course*, 7th ed., Pearson, 2016
5. Moor, D. S. and McCabe, G. P., *Introduction to Statistics*, 3rd ed., W.H. Freeman and Company, 1998.

Important Notes:

- (1) Students are expected to spend a total of 9 hours (i.e. 3 hours of class contact and 6 hours of personal study) per week to achieve the course learning outcomes.
- (2) Students shall be aware of the University regulations about dishonest practice in course work, tests and examinations, and the possible consequences as stipulated in the Regulations Governing University Examinations and Coursework. In particular, plagiarism, being a kind of dishonest practice, is “the presentation of another person’s work without proper acknowledgement of the source, including exact phrases, or summarised ideas, or even footnotes/citations, whether protected by copyright or not, as the student’s own work”. Students are required to strictly follow university regulations governing academic integrity and honesty.
- (3) Students are required to submit writing assignment(s) using Turnitin.
- (4) To enhance students’ understanding of plagiarism, a mini-course “Online Tutorial on Plagiarism Awareness” is available on <https://pla.ln.edu.hk/>.
- (5) Students must adhere to the University’s guidelines and practices when using Generative Artificial Intelligence (GAI) tools. The official documents “*Guidelines for Using GAI Tools at Lingnan University*” and “*Best Practices for Ethical and Responsible Use of GAI Tools in Course Assessments*” can be found here: <https://www.ln.edu.hk/tlc/generative-artificial-intelligence/gai-guidelines-best-practices>.

Rubric for Examination of CDS1003 – Probability and Statistics 1

Criteria	Excellent 80% or above	Good 65% to under 80%	Satisfactory 50% to under 65%	Below Average 35% to under 50%	Poor 0% to under 35%
Formulation of problem	Demonstrates a strong capability of formulating the problem in the context of probability & statistics theory	Demonstrates a good capability of formulating the problem in the context of probability & statistics theory	Demonstrates an adequate level of capability of formulating the problem in the context of probability & statistics theory	Demonstrates an inadequate level of capability of formulating the problem in the context of probability & statistics theory	Fails to demonstrate the capability of formulating the problem in the context of probability & statistics theory
Application of Statistical techniques	Demonstrates a strong understanding of statistical techniques and correct application of the techniques	Demonstrates a good understanding of statistical techniques and correct application of the techniques	Demonstrates an adequate level of understanding of statistical techniques and/or correct application of the techniques	Demonstrates an inadequate level of understanding of statistical techniques and/or correct application of the techniques	Fails to demonstrate an understanding of statistical techniques and/or demonstrates incorrect application of the techniques
Mathematical Accuracy	Able to apply the statistical techniques with 90-100% of the steps and solutions having no mathematical errors	Able to apply the statistical techniques with almost all (80-89%) of the steps and solutions having no mathematical errors	Able to apply the statistical techniques with most (70-79%) of the steps and solutions having no mathematical errors	Able to apply the statistical techniques with a fair amount (51-69%) of the steps and solutions having no mathematical errors	Fails to understand the statistical techniques with the majority (>50%) of the steps and solutions having mathematical errors
Conclusion and interpretation of the results	Able to draw a sensible conclusion based all of the statistical evidence and interpret the result in the context of the original problem	Able to draw a sensible conclusion based on some of the statistical evidence and interpret the result in the context of the original problem	Shows little understanding of the statistical evidence and/or ability to interpret the result in the context of the original problem	Shows little understanding of the statistical evidence and fails to interpret the result in the context of the original problem	Fails to make sense of the statistical evidence and to interpret the result in the context of the original problem

Rubric for Midterm Test of CDS1003 – Probability and Statistics 1

Criteria	Excellent 80% or above	Good 65% to under 80%	Satisfactory 50% to under 65%	Below Average 35% to under 50%	Poor 0% to under 35%
Formulation of problem	Demonstrates a strong capability of formulating the problem in the context of probability & statistics theory	Demonstrates a good capability of formulating the problem in the context of probability & statistics theory	Demonstrates an adequate level of capability of formulating the problem in the context of probability & statistics theory	Demonstrates an inadequate level of capability of formulating the problem in the context of probability & statistics theory	Fails to demonstrate the capability of formulating the problem in the context of probability & statistics theory
Application of Statistical techniques	Demonstrates a strong understanding of statistical techniques and correct application of the techniques	Demonstrates a good understanding of statistical techniques and correct application of the techniques	Demonstrates an adequate level of understanding of statistical techniques and/or correct application of the techniques	Demonstrates an inadequate level of understanding of statistical techniques and/or correct application of the techniques	Fails to understand statistical techniques and/or incorrectly applies the techniques
Mathematical Accuracy	Able to apply the statistical techniques with 90-100% of the steps and solutions having no mathematical errors	Able to apply the statistical techniques with almost all (80-89%) of the steps and solutions having no mathematical errors	Able to apply the statistical techniques with most (70-79%) of the steps and solutions having no mathematical errors	Able to apply the statistical techniques with a fair amount (51-69%) of the steps and solutions having no mathematical errors	Fails to apply the statistical techniques with the majority (>50%) of the steps and solutions having mathematical errors
Conclusion and interpretation of the results	Able to draw a sensible conclusion based all of the statistical evidence and interpret the result in the context of the original problem	Able to draw a sensible conclusion based on some of the statistical evidence and interpret the result in the context of the original problem	Shows little understanding of the statistical evidence and/or ability to interpret the result in the context of the original problem	Shows little understanding of the statistical evidence and fail to interpret the result in the context of the original problem	Fails to make sense of the statistical evidence and to interpret the result in the context of the original problem

Rubric for Individual Assignment of CDS1003 – Probability and Statistics 1

Criteria	Excellent 80% or above	Good 65% to under 80%	Satisfactory 50% to under 65%	Below Average 35% to under 50%	Poor 0% to under 35%
Formulation of problem	Demonstrates a strong capability of formulating the problem in the context of probability & statistics theory	Demonstrates a good capability of formulating the problem in the context of probability & statistics theory	Demonstrates an adequate level of capability of formulating the problem in the context of probability & statistics theory	Demonstrates an inadequate level of capability of formulating the problem in the context of probability & statistics theory	Fails to demonstrate the capability of formulating the problem in the context of probability & statistics theory
Application of Statistical techniques	Demonstrates a strong understanding of statistical techniques and correct application of the techniques	Demonstrates a good understanding of statistical techniques and correct application of the techniques	Demonstrates an adequate level of understanding of statistical techniques and/or correct application of the techniques	Demonstrates an inadequate level of understanding of statistical techniques and/or correct application of the techniques	Fails to understand statistical techniques and/or incorrectly applies the techniques
Mathematical Accuracy	Able to apply the statistical techniques with 90-100% of the steps and solutions having no mathematical errors	Able to apply the statistical techniques with almost all (80-89%) of the steps and solutions having no mathematical errors	Able to apply the statistical techniques with most (70-79%) of the steps and solutions having no mathematical errors	Able to apply the statistical techniques with a fair amount (51-69%) of the steps and solutions having no mathematical errors	Fails to apply the statistical techniques with the majority (>50%) of the steps and solutions having mathematical errors
Conclusion and interpretation of the results	Able to draw a sensible conclusion based all of the statistical evidence and interpret the result in the context of the original problem	Able to draw a sensible conclusion based on some of the statistical evidence and interpret the result in the context of the original problem	Shows little understanding of the statistical evidence and/or interpret the result in the context of the original problem	Shows little understanding of the statistical evidence and fail to interpret the result in the context of the original problem	Fails to make sense out the statistical evidence and to interpret the result in the context of the original problem