HONG KONG BAPTIST UNIVERSITY
COURSE OUTLINE

1. COURSE TITLE

Quantitative Methods for Data Analytics & Artificial Intelligence

2. COURSE CODE

COMP7180

3. NO. OF UNITS

3 Units

4. OFFERING DEPARTMENT

Master of Science in Data Analytics and Artificial Intelligence

5. PREREQUISITES

Nil

6. MEDIUM OF INSTRUCTION

English

7. AIMS & OBJECTIVES

To learn the various quantitative methods necessary for data analytics and artificial intelligence.

8. COURSE CONTENT

I. Linear Algebra
- Basic vector and matrix operations
- Matrix properties: trace, rank, range, and determinant
- Eigenvalues and eigenvectors
- Principal Component Analysis
- Singular Value Decomposition

II. Univariable and Multivariable Differentiation and Calculus
- Introduction to artificial intelligence and machine learning
- Partial derivatives and gradients
- Multivariable chain rule
- Jacobian and Hessian matrices

III. Probability and Statistics
- Conditional probability and independence
- Discrete and continuous random variables
- Expectation and variance
- Multiple random variables
- Maximum likelihood estimation
- Regression analysis

IV. Optimization
- Mathematical optimization
- Convex sets and convex functions
- Least squares and convex optimization
- Gradient descent methods

9. COURSE INTENDED LEARNING OUTCOMES (CILOs)

CILO	By the end of the course, students should be able to:
CILO 1	Describe the essential concepts in linear algebra for data analytics and artificial intelligence
CILO 2	Understand fundamental univariable and multivariable differentiation and calculus for data analytics and artificial intelligence
CILO 3	Explain the essential concepts in probability and statistics for data analytics and artificial intelligence
CILO 4	Understand the essential concepts in optimization for data analytics and artificial intelligence
CILO 5	Determine suitable quantitative methods for effective data analytics
CILO 6	Apply suitable quantitative methods for real-world problem solving

10. TEACHING & LEARNING ACTIVITIES (TLAs)

CILO alignment	Type of TLA
1-4	Students will learn the quantitative methods through lectures, in-class exercises, quizzes, and assignments.
5-6	Students will learn the problem-solving skills using quantitative methods through lectures, tutorials, and assignments.

11. ASSESSMENT METHODS (AMs)

Type of Assessment Methods	Weighting	CILOs to be addressed	Description of Assessment Tasks

Continuous Assessment	40 %	1-6	Assignments and quizzes/tests are designed to assess how well students have learned the quantitative methods and the students' ability in determining suitable quantitative methods for real-world problem solving.
Examination	60 %	1-6	Final examination questions are designed to assess how far students have achieved in understanding and applying quantitative methods for data analytics and artificial intelligence.

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