

Hong Kong Baptist University
Faculty of Science
Department of Mathematics

Title (Units): MATH 1000 SUPPLEMENTARY MATHEMATICS (CALCULUS AND LINEAR ALGEBRA) (0,3,0)

Course Aims: This course deals with the basic linear algebra, elementary functions and elementary calculus. It provides a good foundation for the students who have not taken AL Pure Mathematics.

Prerequisite: None

Prepared by: Dr K I Liu

Learning Outcomes (LOs):

Upon successful completion of this course, students should be:

No.	Learning Outcomes (LOs)
	Knowledge
1	Able to know the matrix structure and its operations
2	Able to understand the ideas behind the methods to solve the system of linear equations
3	Able to understand the properties of the solution of system of linear equations and elements of linear algebra
4	Able to know different kinds of functions and their properties
5	Able to understand the basic ideas of limit, differentiation and integration
6	Able to understand the fundamental theorem of calculus
	Skills
7	Able to carry out basic matrix operations
8	Able to solve system of linear equations by different methods
9	Able to apply the binomial theorem
10	Able to find limits of different functions
11	Able to find derivatives of different functions
12	Able to find integrals of different functions
13	Able to apply calculus to solve practical problems
	Attitude
14	Able to aware the importance of matrix theory and calculus in science

Assessment:

No.	Assessment Methods	Weighting	Remarks
1	Continuous Assessment	30%	Continuous Assessment are designed to measure how well the students have learned the basic matrix operations, solution of system of equations and basic differentiation and integration.
2	Final Examination	70%	Final Examination questions are designed to see how far students have achieved their intended learning outcomes. Questions will primarily be analysis and skills based to assess the student's ability in solving simultaneous equations, differentiation and integration.

Learning Outcomes and Weighting:

Contents		LO No.	Teaching (in hours)
I	Matrices and Vectors	1,7	3
II	System of Linear Equations	2,8,14	4
III	Theory of System of Equations and Elements of Linear Algebra	3	3
IV	Binomial Theorem	4,9	2
V	Elementary Functions	4	6
VI	Limits of Functions	5,10,14	4
VII	Differentiation and Its Applications	5,11,13,14	8
VIII	Integration and Its Applications	5,12,13,14	8

Textbook: Barnett, Ziegler and Byleen, College Algebra, 8th Ed., McGraw-Hill, 2007

Hoffmann and Bradley, Applied Calculus for Business, Economics and the Social and Life Science, Expanded Edition, McGraw-Hill, 2007

References: Anton, Bivens and Davis, Calculus, 7th Ed., Wiley, 2001

Barnett, Ziegler and Byleen, Precalculus, 6th Ed., McGraw-Hill, 2007

Larson, Hostetler and Edwards, Calculus (With Analytic Geometry), 8th Ed., Houghton Mifflin Company, 2005

Kreyszig, Advanced Engineering Mathematics, 9th Ed., Wiley, 2005

Course Contents in Outline:

	<u>Topics</u>	<u>Hours</u>
I.	Matrices and Vectors A. Matrix operations B. Determinant C. Inverse	3
II.	System of Linear Equations A. Coefficient matrix and argument matrix B. Crammer's rule C. Gaussian elimination	4
III.	Theory of System of Equations and Elements of Linear Algebra A. Homogeneous system B. Conditions for consistent system C. Linear independence D. Vector space E. Rank of a matrix F. Introduction to eigenvalue and eigenvector	3
IV.	Binomial Theorem A. Permutation and combination B. Formula of Binomial Theorem C. Applications of Binomial Theorem to derive different equalities	2
V.	Elementary Functions A. Domain and range B. Piecewise-defined functions and composition of functions C. Polynomials and Fundamental Theorem of Algebra D. Remainder Theorem E. Rational functions and partial fractions F. Exponential functions and logarithm functions G. Trigonometric functions	6
VI.	Limits of Functions A. Basic concept of the limit of a function B. Properties of limit of different functions C. Introduction to rigorous definition D. Continuity of a function E. Intermediate Value Theorem	4

VII.	Differentiation and Its Applications	8
	A. Tangent line and derivative	
	B. Differentiation of different functions	
	C. Implicit differentiation	
	D. High-order derivatives	
	E. Mean Value Theorem	
	F. Indeterminate forms and l'Hospital rule	
	G. Maxima, minima and concavity	
	H. Taylor series and power series	
VI.	Integration and Its Applications	8
	A. Antiderivatives and integration formulae	
	B. Integration by substitution	
	C. Integration by parts and reduction Formulae	
	D. Integration of rational functions	
	E. Area as limit and definite Integral	
	F. Fundamental Theorem of Calculus	
	G. Mean-Value Theorem for integrals	
	H. Volume by slicing, method of disks and method of washers	