

Hong Kong Baptist University
Faculty of Science
Department of Mathematics

Title (Units): MATH 1590 CALCULUS AND LINEAR ALGEBRA FOR CHEMISTRY (3,3,0)

Course Aims: This course introduces topics in linear algebra, mathematical analysis and differential equations. Applications to chemistry are provided.

Prerequisite: Nil

Prepared by: L.Ling

Learning Outcomes (LOs):

Upon successful completion of this course, students should be:

No.	Learning Outcomes (LOs)
	Knowledge
1	Able to explain basic concepts and theories from linear algebra and calculus
2	Able to describe concepts of elementary functions including algebraic, exponential and logarithmic functions
3	Able to evaluate limits, derivatives and Taylor series expansions of functions
4	Able to understand basic concepts and solution of differential equation
	Skills
5	Able to implement basic operations for vectors, matrices, determinants, and solve linear systems of equations
6	Able to implement basic operations for elementary functions
7	Able to apply mathematical methods of calculus and linear algebra to solve a range of problems in chemistry
8	Able to communicate effectively with others and present mathematical results in a logical and coherent fashion
9	Able to use symbolic package Maple
	Attitude
10	Able to extend their knowledge of mathematical techniques and adapt known solutions to various fields and situations

Assessment:

No.	Assessment Methods	Weighting	Remarks
1	Tests and assignments	30%	Tests and assignments are designed to measure how well the students have learned the basic concepts and techniques of linear algebra and versatility in calculus.
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 advanced problems on linear algebra and calculus together with their applications in chemistry.

Learning Outcomes and Weighting:

Contents		LO No.	Teaching (in hours)
I	Elementary Functions	2,6,8,9,10	3
II	Limit and Continuity	1,3,7,8,9,10	3
III	Differentiation	1,3,7,8,9,10	9
IV	Integration	1,3,7,8,9,10	6
V	Elementary Linear Algebra	1,5,7,8,9,10	9
VI	Calculus of several variables	1,7,8,9,10	5
VII	Ordinary differential equations	4,8,9,10	5

Textbook: Leevan Ling, Calculus and Linear Algebra with Maple, lecture notes, 2008.

References: J.R. Barrante, Applied Mathematics for Physical Chemistry, 2nd Edition, Prentice-Hall, 1998.

Erich Steiner, The Chemistry Maths Book, Oxford Science Publications, 1996.

G. Doggett & B.T. Sutcliffe, Mathematics for Chemists, John Wiley, 1995.

Course Contents in Outline:

	<u>Topics</u>	<u>Hours</u>
I.	Elementary Functions A. Algebraic functions B. Exponential and logarithmic functions C. Trigonometric functions	3
II.	Limit and Continuity A. Limit B. Continuity	3
III.	Differentiation A. Tangent line B. Differentiation and derivative C. General differentiation rules D. Mean value theorem E. Higher-order derivatives F. Implicit differentiation G. Differentials and linear approximation H. Taylor series I. Sketch a function	9
IV.	Integration A. Definite integral B. Integration techniques	6
V.	Elementary Linear Algebra A. Linear equations B. Matrix and vector C. Solving a linear system D. Inverse matrix E. Matrix decompositions	9
VI.	Calculus of several variables A. Limit and continuity B. Partial derivatives of a function of two variables C. Local maxima, local minima and saddle points D. Multiple integrals	5
VII.	Ordinary Differential Equations A. Initial value problem B. Solving linear ODEs C. Solving nonlinear ODEs	5

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