

Hong Kong Baptist University
Faculty of Science
Department of Mathematics

Title (Units): MATH1570 ADVANCED CALCULUS (3,3,0)

Course Aims: This course gives students fundamental mathematical knowledge in a wide variety of areas including vector algebra, vector differentiation and integration, as well as an introduction to basic linear algebra.

Prerequisite: Year I standing

Prepared by: Prof Wu Xiaonan

Learning Outcomes (LOs):

Upon successful completion of this course, students should be:

No.	Learning Outcomes (LOs)
	Knowledge
1	Able to understand the concept of function
2	Able to understand the concept of derivative and partial derivative
3	Able to understand the concept of integration
4	Able to understand the concept and theory of line and surface integrals
5	Able to understand the concept and theory of vector fields
6	Able to understand the concept and theory of matrix
7	Able to understand the concept of linear space
	Skills
8	Able to use graphing techniques for functions
9	Able to establish the rules for integration
10	Able to apply the partial derivatives for some applications
11	Able to apply the theory of vector fields for some applications
12	Able to solve linear systems
13	Able to solve eigenvalue problems

Assessment:

No.	Assessment Methods	Weighting	Remarks
1	One 1-hour Test and Continuous Assessment	30%	The one 1-hour Test is designed to measure how well the students have learned the basic concepts and skills for function, derivative, and integral.
2	Final Examination	70%	Final Examination questions are designed to see how far students have achieved their intended learning outcomes. Questions will primarily be concept and skills based to assess the student's versatility in solving problems in differentiation, integration, vector fields, and matrix theory.

Learning Outcomes and Weighting:

Contents		LO No.	Teaching (in hours)
I	Functions of a single variable	1,2	3
II	Differentiation and integration with a single variable	2,3,9	3
III	Calculus of several variables	2,3,10	11
IV	Vector fields	4,5,11	11
V	Basic linear algebra	6,7,12,13	12

Textbook: Dale Varberg and Edwin J. Purcell, Calculus with Analytical

References: G. Thomas, R. Finney, M. D. Weir, and F. R. Giordano, Thomas' Calculus, 10th Edition, Pearson Addison Wesley, 2002.

D. Hughes-Hallett, A. M. Gleason, and W. G. McCallum, Calculus, 3rd edition, John Wiley & Sons, 2003.

K.F. Riley, M.P. Hobson & S.J. Beuce, Mathematical Methods for Physics and Engineering, Cambridge University Press, 1998.

Course Contents in Outline:

	<u>Topics</u>	<u>Hours</u>
I.	Functions of a single variable A. Elementary functions B. Graphical representation C. Minimum, maximum, asymptotes, and basic graphing techniques	3
II.	Differentiation and integration with a single variable A. Derivatives and integrals with graphical representation B. Basic algebraic manipulations C. Examples of functions that can be integrated in closed form D. Taylor series	3
III.	Calculus of several variables A. Coordinate systems (cartesian, cylindrical, spherical, etc.) B. Function of several variables and its graphic representation C. Partial derivatives D. Finding extremum, multiple integrals E. Parametrization of curves and surfaces	11
IV.	Vector fields A. Scalar and vector fields B. Gradient, divergence, curl C. Laplace operators, line integrals, surface integrals D. Flux, Gauss' and Stokes theorem, Green's theorem	11
V.	Basic linear algebra A. Solution of a linear set of equations B. Matrices and determinants C. Addition and multiplication of matrices D. Vector space, base set, and linear transformations E. Identity matrix and inverse matrix	12