MATH 1003 Calculus and Linear Algebra

Course Outline - Fall 2023

1. Instructors

- (L1) Dr. XU, Zili
    - Office: 3478, email: xuzili@ust.hk

- (L2 and L3) Dr. WU, Yueping
    - Office: 3486, email: maypwu@ust.hk

- (L4) Dr. YAO, Jing
    - Office: 3450, email: majyao@ust.hk

2. Teaching Assistants

- (T1A, T1B) WEI Yufeng/yweibe

- (T1C, T1D) FAN Junyi/jfanap

- (T2A, T2B, T2C, T2D) LAU Hing Sang/mahslau

- (T3A, T3B) QUAN Xueyang/xquan

- (T3C, T3D) LIU Chen/cliudh

- (T4A, T4B) HU Tiankai/thuah

- (T4C, T4D) XIAN Zhuozhi/zxian

3. Meeting Time and Venue

- <u>Lectures</u>
    - L1: Tuesday & Thursday 16:30 - 17:50 (LTJ)
    - L2: Monday 15:00 - 16:20, Friday 10:30 - 11:50 (LTJ)
    - L3: Monday 13:30 - 14:50, Friday 9:00 - 10:20 (LTJ)
    - L4: Tuesday & Thursday 9:00 - 10:20 (G010, CYT)

- <u>Tutorials</u>

Class	Weekday	Start Time	End Time	Rooms
T1A	Tuesday	18:00	18:50	1104
T1B	Wednesday	17:30	18:20	2303
T1C	Friday	12:30	13:20	LIB-LG4-26
T1D	Friday	10:00	10:50	2406
T2A	Wednesday	18:00	18:50	1410
T2B	Tuesday	18:00	18:50	2306
T2C	Thursday	18:00	18:50	CYTG009A
T2D	Friday	12:00	12:50	LTK
T3A	Friday	18:00	18:50	2465
T3B	Tuesday	18:00	18:50	6591
T3C	Wednesday	13:30	14:20	4621
T3D	Wednesday	18:00	18:50	2404
T4A	Thursday	18:00	18:50	LSK1009
T4B	Thursday	17:00	17:50	LSK1011

T4C	Tuesday	18:00	18:50	2504
T4D	Friday	18:00	18:50	LSK1014

4. Course Description

Duration: one semester. Credits: 3 units.

This course teaches basic application techniques in single-variable calculus and linear algebra.

Key topics include: systems of linear equations and matrices, functions and graphing, derivatives andoptimization, integration and applications.

Exclusion(s): B or above in HKCEE Additional Mathematics; AS Mathematics and Statistics; AL/AS Applied Mathematics; AL Pure Mathematics; MATH 1013, MATH 1014, MATH 1018, MATH 1020, MATH 1023, MATH 1024; any MATH course at or above 100-/2000-level.

Prerequisite(s): HKCEE Mathematics

5. Intended Learning Outcomes (ILOs)

Upon the end of the course, students should be able to:

1. Solve basic mathematical problems related to interest rate and annuity
2. Formulate and solve typical problems by using systems of linear equations and matrices
3. Understand various properties of typical functions
4. Find the derivatives of typical functions
5. Apply differentiation to find optimization conditions
6. Use basic techniques of integration

6. Assessment Scheme

Based on one midterm examination, one final examination, and online homework (WeBWork).

Assessment	Assessing Course ILOs
Online homework (WeBWork): 10 %	1,2,3,4,5,6
Midterm Exam: 25 %	1,2
Final Exam: 65 %	3,4,5,6

7. Student Learning Resources

Lecture Notes:

Lecture notes can be downloaded at the course website.

Textbooks:

College Mathematics for Business, Economics, Life Sciences, and Social Sciences (Fourteenth Edition), byRaymond A. Barnett, Michael R. Ziegler and Karl E. Byleen.

8. Teaching and Learning Activities

Scheduled activities per week: 4 hours (lecture + tutorial)

9. Tentative Course Schedule (Subject to change)

Week	Content	Remarks
1	2.1 Simple Interest 2.2 Compound Interest, Growth and Time 2.3 Future Value of an Annuity, Sinking Fund	
2	2.4 Present Value of an Annuity, Amortization 3.1 System of Linear Equations in 2 Variables 3.2 Augmented Matrices	
3	3.3 Gauss-Jordan Elimination and Applications 3.4 Matrices, Addition and Subtraction, Multiplication	
4	3.5 Inverse of a Matrix 3.6 Matrix Equations	
5	3.7 Leontief Input-Output Analysis 8.1, 8.4 Rate of Change, Slope of the Tangent Line, Derivative	
6	8.5 Differentiation Properties, Power Rule 9.1 Continuous Compound Interest 9.2 Derivative of Exponential Function and Logarithmic Function	
7	9.3 Product Rule and Quotient Rule 9.4 Chain Rule	
8	9.5 Implicit Differentiation 9.6 Related Rates 10.1 First Derivative and Graph	
9	10.2 Second Derivative and Graph 8.2 Infinite Limits and Limits at Infinity 10.4 Curve-Sketching	
10	10.5 Absolute Maxima and Minima 10.6 Optimization	
11	11.1 Anti-derivatives and Indefinite Integrals 11.2 Integration by Substitution 11.4 Definite Integrals	
12	11.5 Fundamental Theorem of Calculus 11.6 Area Between Curves	
13	[Optional Topics]	