MATH 1005 Calculus and Statistics

Course Outline - Fall 2026

1. Instructor(s)

- (L1, L2) Dr. YAO, Jing
  - Office: Room 3450; Email: majyao@ust.hk

2. Teaching Assistants

- (T1A, T1B) LUO, Jianzhou / jluobn@connect.ust.hk
- (T1C, T1D, T2A, T2B) POON Pak Hei Andersen / poonpha@ust.hk
- (T2C, T2D) ZENG, Yeqin / yzengbj@connect.ust.hk

3. Meeting Time and Venue

- Lectures

Class	Days & Times	Room	Class Dates
L1	MoWe 9:00AM - 10:20AM	Lecture Theater F	Sep 2, 2026-Sep 30, 2026
		LG6101, Teaching Hub	Oct 5, 2026-Nov 30, 2026
L2	Mo 1:30PM - 2:50PM	Lecture Theater F	Sep 4, 2026-Oct 2, 2026
	Fr 9:00AM - 10:20AM	Lecture Theater F	
	Mo 1:30PM - 2:50PM	LG4101, Teaching Hub	Oct 5, 2026-Nov 30, 2026
	Fr 9:00AM - 10:20AM	LG4101, Teaching Hub	

- Tutorials
  - T1A: Mo 04:30PM - 05:20PM (Room2406)
  - T1B: Fr 10:30AM - 11:20AM (Room 5402)
  - T1C: Fr 12:00PM - 12:50PM (Room 6555)
  - T1D: Mo 06:00PM - 06:50PM (Room 6555)
  - T2A: Mo 09:30AM - 10:20AM (Room 2404)
  - T2B: Mo 11:00AM - 11:50AM (Room 2503)
  - T2C: Th 10:30AM - 11:20AM (Room 4503)
  - T2D: Mo 06:00PM - 06:50PM (Room 1527)

Tutorial classes start from Week 2 (Sep 7, 2026). There are no tutorials during Week 1.

4. Course Description

Duration: one semester. Credits: 4 units.

The course covers basic applications and techniques of single-variable calculus, statistics and probability.

Key topics of calculus include: differentiation and integration of trigonometric, exponential and logarithmic functions, graphing, optimization, and probability.

Key topics of statistics and probability include: basic theory and applications of various discrete

and continuous probability distributions, random sampling techniques including confidence intervals and hypothesis testing.

Exclusion(s): Level 5 or above in HKDSE Mathematics Extended Module M1 or M2; MATH 1003, MATH 1006, MATH 1012 (prior to 2025-26), MATH 1013, MATH 1014, MATH1020, MATH 1023, MATH 1024

Prerequisite(s): Level 2 or above in HKDSE Mathematics (Compulsory Part)

5. Intended Learning Outcomes (ILOs)

On successful completion of the course, students will be able to:

1. Apply computational techniques of single-variable calculus on solving scientific problems.
2. Apply basic statistics and probability knowledge on solving scientific problems.
3. Develop computational skills of single-variable calculus for preparation of intermediate-level mathematics courses.

6. Assessment Scheme

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

- Scheme 1: Homework (15%) + Midterm Exam (25%) + Final Exam (60%)
- Scheme 2: Homework (15%) + Midterm Exam (0%) + Final Exam (85%)

The maximum of the total scores between schemes (1) and (2) will be taken to determine the final grades.

- WeBWorK homework: No late submission will be accepted. Course ILOs: 1, 2, 3.
- Midterm exam: Time and Venue to be confirmed.
  No make-up exams for the midterm exam.
  Course ILOs: 1.
- Final Exam: to be arranged by ARO.
  Only legitimate excuses (such as illness with official medical record) will be considered for a make-up exam.
  Course ILOs: 1, 2, 3.

This course will be assessed using **criterion-referencing**, and grades will **not** be assigned using a curve. Letter Grades will be assigned based on the total marks achieved in the above assessments.

Grade Descriptors:

Grades	Short Description	Elaboration on subject grading description
A	Excellent Performance	The student has mastered almost all concepts and techniques of single-variable calculus, probability and statistics taught in the course, has excellent understanding of the deepest content of the subject, and acquired workable knowledge for further studies of calculus, statistics and related fields.
B	Good Performance	The student has mastered most computational techniques of single-variable calculus, probability and statistics taught in the course, yet the understanding of some challenging concepts may not be deep enough for further studies on related advanced subjects.
C	Satisfactory Performance	The student meets the minimum expectation of the instructor, has acquired some basic computational techniques of the subject, yet some concepts were not

		clearly understood.
D	Marginal Pass	The student is only able to recall some fragments of topics and is able to complete some of the easiest computations.
F	Fail	The student does not have sufficient understanding of even some fragments of topics, and is not even able to complete some of the easiest computations.

Course AI Policy:

The use of ChatGPT or other generative AI is not allowed in homework and exams.

Academic integrity:

Students are expected to adhere to the university's academic integrity policy. Students are expected to uphold HKUST's Academic Honor Code and to maintain the highest standards of academic integrity. The University has zero tolerance of academic misconduct.

7. Student Learning Resources

Main reference: Lecture notes can be downloaded at the course website on Canvas.

Study References:

- *College Mathematics for Business, Economics, Life Sciences, and Social Sciences*, by Raymond A. Barnett, Michael R. Ziegler and Karl E. Byleen.
- *Biocalculus: Calculus, Probability, and Statistics for the Life Sciences*, by James Stewart, and Troy Day.
- *Calculus for Scientists and Engineers: Early Transcendentals*, by William Briggs, Lyle Cochran, and Bernard Gillett.

8. Teaching and Learning Activities

Scheduled activities per week: 4 hours (lecture for 3 hours + tutorial for 1 hour)

9. Tentative Course Schedule (*Subject to change*)

Lecture 01
Introduction
Review of functions

Lecture 02
Representing functions

Lecture 03
Exponential and logarithmic functions

Lecture 04
Trigonometric functions

Lecture 05
Trigonometric functions

Lecture 06
Introduction to Derivatives (Derivatives and rates of change, slope of the tangent line)

Lecture 07
Basic differentiation properties

Lecture 08
Basic differentiation formulas, derivatives of essential functions

Lecture 09
Product rule and Quotient rule

Lecture 10
The chain rule

Lecture 11
Implicit differentiation; Related rates

Lecture 12
Applications of differentiation

Lecture 13
Applications of differentiation

Lecture 14
Antiderivatives; Indefinite integrals

Lecture 15
Definite integrals

Lecture 16
Fundamental theorem of Calculus

Lecture 17
Techniques of integration (Substitution rule; Integration by parts)

Lecture 18
Optional topics in Calculus

Lecture 19
Basic theory in Probability theory

Lecture 20
Conditional probability

Lecture 21
Discrete random variables

Lecture 22
Continuous random variables

Lecture 23
Basic concepts in statistics; Basic theory on random sampling

Lecture 24
Parameter estimation

Lecture 25
Introduction to hypothesis testing

Lecture 26
Optional topics in Statistics