

MATH 1005 Calculus and Statistics

Course Outline - Fall 2025

1. Instructor(s)

- (L1 and L2) Dr. YAO, Jing
 - Office: 3450, email: majyao@ust.hk

2. Teaching Assistants

- (T1A, T1B, T2D) KWOK, Cheuk Yin Felix / mafelix@ust.hk
- (T1C, T1D, T2A, T2B, T2C) CHENG, Kei Tsi Daniel / madcheng@ust.hk

3. Meeting Time and Venue

- Lectures
 - L1: Tue/Thu 16:30-17:50 (LTD)
 - L2: Wed/Fri 13:30 - 14:50 (CYTG010)
- Tutorials
 - T1A: Tue 12:30-13:20 (1409)
 - T1B: Tue 14:00-14:50 (2504)
 - T1C: Mon 18:00-18:50 (LG3008)
 - T1D: Mon 17:00-17:50 (1409)
 - T2A: Wed 09:30-10:20 (2504)
 - T2B: Tue 18:00-18:50 (5404)
 - T2C: Wed 18:00-18:50 (CYTG009B)
 - T2D: Wed 18:00-18:50 (5404)

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: 1.5 hour exam, **October 25th (Saturday), 10:30-12:00.**
No make-up exams for the midterm exam.
Course ILOs: 1.
- Final Exam: 2.5 hour 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*)Week 01:

Introduction

Review of functions; Representing functions; Exponential and logarithmic functions

Week 02:

Trigonometric functions

Derivatives and rates of change, slope of the tangent line

Week 03:

Basic differentiation formulas

Derivatives of essential functions

Week 04:

Product rule and Quotient rule

The chain rule

Week 05:

Implicit differentiation

Related rates

Week 06:

Applications of differentiation

Antiderivatives; Indefinite integrals

Week 07:

Definite integrals; Fundamental theorem of Calculus

Substitution rule

Week 08:

Integration by parts

Other topics in Calculus

Week 09:

Basic theory in Probability theory

Week 10:

Random variables

Week 11:

Basic theory on random sampling

Week 12:

Point estimation

Interval estimation

Week 13:

Introduction to hypothesis testing