

# Course Outline of MAT1001: Calculus I

L05: TuesThurs 3:30p-5:20p TB\_103

L08: TuesThurs 1:30p-3:20p TB\_202

## Course Instructor

Xiaokai Liu (刘晓恺)

[xiaokailiu@cuhk.edu.cn](mailto:xiaokailiu@cuhk.edu.cn)

Office: Chengdao 609

Office Hours: TuesThurs 6:00p-7:30p

Appointments may also be set up via emails.

## Course Description

This course covers one-variable calculus. It emphasizes intuitive and conceptual understanding of theory of Calculus, as well as computation skills; it cultivates the ability to use Calculus to solve problems within mathematics and from other scientific disciplines.

## Course Material

**[Textbook]** *Thomas' Calculus (13th Edition in SI Units)*, George B. Thomas Jr., Maurice D. Weir, Joel R. Hass. Publisher: Pearson.

**[Reference Book]** *Calculus: Early Transcendentals (8th Edition)*, James Stewart. Publisher: Brooks Cole.

*Additional supplementary notes may be posted on Blackboard.*

## Course Assessment

Assignments: 20%

Quizzes: 10%

Midterm examination: 25% (Tentative midterm date: Saturday, Oct 29)

Final examination: 45%

## **Teaching Assistants (TA) and Tutorial Sections**

### **L05**

廖焕新 Huanxin Liao 221019077@link.cuhk.edu.cn

Tutorial T21 TD\_111 Mon 6:30p-8:00p

李路嘉 Lujia Li 222010036@link.cuhk.edu.cn

Tutorial T22 TD\_111 Tue 6:30p-8:00p

许逸群 Yiqun Xu 220019068@link.cuhk.edu.cn

Tutorial T23 TD\_111 Wed 6:30p-8:00p

张逸鹏 Yipeng Zhang 220019181@link.cuhk.edu.cn

Tutorial T24 TD\_111 Thur 6:30p-8:00p

Tutorial T25 TD\_111 Fri 6:30p-8:00p

### **L08**

李文烁 Wenshuo Li 220019072@link.cuhk.edu.cn

Tutorial T36 TD\_114 Wed 7:30p-9:00p

张雪凝 Xuening Zhang 116010302@link.cuhk.edu.cn

Tutorial T37 TD\_114 Thur 6:00p-7:30p

Tutorial T38 TD\_114 Thur 7:30p-9:00p

李飞飞 Feifei Li 221019085@link.cuhk.edu.cn

Tutorial T39 TD\_114 Fri 6:00p-7:30p

Tutorial T40 TD\_114 Fri 7:30p-9:00p

## **Tutorials**

In addition to lectures, each student is assigned with an 80-minute tutorial each week.

- Tutorials will start from September 12 (no tutorial in the first week, Sept 5 - 9).
- Tutorials will be conducted by teaching assistants (TAs).

- TAs will go over some assignment problems (additional examples may be presented if time permits).
- Quizzes will be conducted in tutorials.
- Assignments should be submitted in tutorials.
- You must attend your assigned tutorial section (i.e., if you are in Tutorial T03, you CANNOT attend T05), or your quiz and assignment grades will NOT be recorded.

## Quizzes

- There will be four 30-minute quizzes in total. Quiz dates are:
  - Quiz 1: Sept/19-23
  - Quiz 2: Oct/10-14
  - Quiz 3: Nov/14-16
  - Quiz 4: Dec/5-9
- There will not be any make-up quizzes **for any reason**. Instead, to compensate special situations (including, but not limited to, sickness, injury, stress, and family emergency) while keeping logistic simplicity, **your lowest quiz score will not be counted toward the term grade** (i.e., only your best three will count).

## Assignments

- In each week, there will be one assignment (except special situations, such as holidays).
- Each assignment will cover topics taught in the current week and should be submitted in the tutorial held in next week in your tutorial section.
- Selected questions will be graded. The worst assignment will not be counted.
- No late submission will be accepted.
- No solution will be posted for the assignments. (Use the tutorials wisely!)

## Policy of Assignments/Quizzes/Exams

- You are allowed (and encouraged) to discuss the assignment problems with your classmates, but you should always write your own solution independently. Direct copying or slight changes in symbols would be considered cheating; **any cheating cases will result in a grade of zero and may be reported to the Academic Disciplinary Committee.**
- There will not be any make-up midterm. Make-up final exam is only possible if the absent student could provide a strong valid reason with formal documental proof and has his/her application submitted within five days since the exam day. (Remembering the wrong exam time, setting the alarm time incorrectly, etc., are not considered valid reasons.)
- All quizzes and exams are close-book; notes, calculators and dictionaries will **NOT** be allowed.

## Course Contents

This course will cover most contents of Chapters 2 to 9 in the textbook, except 2.3, 6.6, 7.7, 8.1, 8.6, and 8.9 (these six sections will not be on the assignments/quizzes/exams, but your instructor may still cover them in class). The following is an outline of the course contents, which may be adjusted slightly as the term progresses.

- Rates of change, Limit of a function and limit laws, one-sided limits, continuity, infinite limits, asymptotes of graphs.
- The derivative and tangent line at a point, derivative functions, higher order derivatives, differentiation rules, derivative of trigonometric functions, chain rule, implicit differentiation, related rates.
- Linearization and differentials, extreme values of a function, mean value theorem, monotonicity, first derivative test.
- Concavity, second derivative test, curve sketching, applied optimization.

- Newton' s method, area approximation by using left, right, and mid sums, limits of these sums, definite integrals.
- Fundamental theorem of calculus, antiderivatives and indefinite integrals, substitution method.
- Area between curves, volumes using cross-sections and cylindrical shells, arclength.
- Work and fluid forces, inverse functions and their derivatives, natural log, exponential functions.
- L' Hôpital' s rule, inverse trigonometric functions, relative rates of growth, integration by parts.
- Trigonometric integrals, trigonometric substitutions, partial fractions method.
- Numerical integration: by rectangle, trapezoidal and Simpson' s rules, improper integrals.
- First-order ordinary differential equations (ODE): solutions, slope fields, Euler' s method, linear equations, separable equations.
- Applications of ODE: “mixing problems” , Malthusian model, Logistic model, autonomous equations, phase-line analysis.