MATH 2023

Multivariable Calculus

Mo 1:30PM–2:50PM, Fr 9:00AM–10:20AM
Rm 4620, Lift 31-32

Spring 2023-2024

Instructor: Quoc Ho.
Email: maqho@ust.hk.
Office: Room 3477.
Course Webpage: Canvas.
Office Hours: Mondays, 3:00pm–4:30pm (or by appointment)
TAs:
- CUI Daorong/dcuiab (T1A)
- LIU Zhetian/zliucl (T1B)
- LIU Ziyun/zliueq (T1C)

TAs' Office Hours: by appointment

Problem Sessions: Problem Sessions are weekly forums in which students can solve and present problems with guidance from each other as well as the TAs. The purpose of the sessions is to give students focused practice with the more difficult material of the course. Attendance is strongly encouraged.

Resources:
(i) **Textbook:** CALCULUS: EARLY TRANSCENDENTALS, METRIC VERSION, 9th edition, James Stewart, Daniel Clegg, Saleem Watson (chapters 12 to 16).
(ii) **Course notes (from a previous version of the course):** https://thfong.files.wordpress.com/2022/07/main.pdf

The main reference is the textbook. The course notes by Prof. Fong can also be used as supplementary material. Summaries for the lectures might also be available on Canvas.

Intended learning outcomes:
(i) Understand the core concepts of multivariable calculus.
(ii) Be able to recognize the power of abstraction and generalization, and to carry out mathematical work with independent judgment.
(iii) Be able to apply rigorous, analytic, and numeric approach to analyze and solve problems.
(iv) Be able to explain clearly concepts and calculations from multivariable calculus.
(v) Develop mathematical maturity to undertake higher level studies in mathematics and related fields.

All components of the course, lectures, tutorial sessions, and homework, are necessary to achieve the intended learning outcomees

Grading: Tentatively, final grades will be computed according to the following breakdown:
10% Homework (WeBWorK),   35% Midterm (date to be determined),   55% Final Exam

Homework: Homework problems will be assigned on WeBWork. Although homework counts for only 10% of the final grade, please do not take them lightly. They are designed to help you have a good grasp of the materials and will ultimately prepare you for the exams. You are advised to attempt the homework problems as early as possible as they will also prepare you for a better understanding of the lectures. You may work in groups and discuss homework problems with other students, but it is crucial to make sure that you understand how to do the problems yourself.

Besides the homework, it is important to try as many problems as possible in the textbook in those sections that are relevant to the lectures.

Final Exam: You will take a closed-book comprehensive final exam which covers all the materials taught in the whole semester, including those already tested in the midterm exam. The focus, however,

will be on those topics not covered in the midterm. No notes or calculators are allowed in the exams. More information will be given prior to the exams. No make-up exams.

Teaching schedule (tentative):

Week 1	Review of Vectors in 3D, Cross Product, Dot Product, Lines and Planes
Week 2	Vector-valued Functions, Curves and Arc Length
Week 3	Multivariable Functions, Limits and Continuity, Partial Derivatives
Week 4	Tangent Planes, Linear Approximation, Chain Rules
Week 5	Directional Derivatives, Gradient Vector
Week 6	Optimization Problems, Lagrange Multipliers
Week 7	Double Integrals, Polar Coordinates, Surface Area
Week 8	Triple Integral, Cylindrical and Spherical Coordinates
Week 9	Vector Fields, Conservative Fields
Week 10	Line Integrals
Week 11	Green's Theorem, Curl and Divergence
Week 12	Parametric Surface
Week 13	Surface Integral Stokes' Theorem, Divergence Theorem
Week 14	Miscellany/review

Additional Comments

The MATH 2023 course is challenging and fast-paced. Full mastery of the material generally takes time beyond the lectures and the homework. Some suggestions that you may find useful:

- Review notes from class regularly. Rework the exercises. Write summaries and highlight important ideas.
- Read the textbook. Work through additional examples and problems. Write summaries and key points.
- Make use of other resources, such as other books, online notes, or web tutorials.
- Attend tutorials. Bring questions, exercises, or points of confusion.
- Come to office hours. Bring questions, exercises, or points of confusion.
- Join study groups to discuss the material and homework with peers.

Midterm and Final Exams

Our class will write one midterm, which will, tentatively, happen on week 7. The final exam will cover material from the entire quarter. No books, outside materials, or electronic devices (including calculators) are allowed in the exams. If you really have to miss the midterm exam, please give me as much notice as possible. There are NO for-credit make-up tests except in extreme circumstances in general. Instead, the final exam will be reweighted. I encourage students to make arrangements with me to write missed tests – NOT FOR CREDIT, but for feedback on their work.

Grade Assignment

There is no predetermined correspondence between final numerical scores and letter grades, and grades are not fit to any predetermined target distribution. I will decide at the end of the semester how numerical scores translate into letters, taking into account factors such as the length and difficulty of the exams, and overall class performance.