MATH 3033 (L1 and L2) Real Analysis Course Outline – Fall 2023

1. Instructor

Name: Dr. Ku, Yin Bon

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Office hour: TBA

2. Teaching Assistant

T1A, T1B: Zhang, Jinyang

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T2A, T2B: Liu, Xinyu

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3. Online Meeting Time

Lectures: L1: Tu Th 10:30AM – 11:50AM at LTK,
L2: Mo 3:00PM – 4:20PM Fr 10:30AM – 11:50AM at Rm 2504

Tutorials: T1A: Th 6:00PM – 5:50PM at LTH, T1B: Mo 12:00PM – 12:50PM at Rm 2303
T2A: Fr 4:30PM – 5:20PM at Rm 2463, T2B: Th: 6:00PM – 6:50PM at Rm 2303

4. Course Description

Credit Points: 4

Pre-requisite: (MATH 2010/ MATH 2011/ MATH 2021/ MATH 2023) AND (MATH 2031/ MATH 2033/ MATH2043) AND (MATH 2111/ MATH 2121/ MATH 2131/ MATH 2350)

Brief Information/synopsis: This course covers basics of set topology, differentiation and inverse function theorems of vector-valued functions, uniform convergence, Lebesgue measure and Lebesgue integral on the real line.

5. Intended Learning Outcomes

Upon successful completion of this course, students should be able to:

No.	ILOs
1	Understand logical deduction of important facts in mathematical analysis of high dimension spaces and apply integration theory to solve mathematical and statistical problems.
2	Apply rigorous analytical techniques taught in class to solve problems in convergence frequently appeared in the mathematical profession.

6. Assessment Scheme

a. Examinations: midterm exam and final exam (dates to be announced)
b. Percentage of coursework, examination, etc.:

Assessment	Assessing Course ILOs
5% by class participation	1, 2
10% by Homework	1, 2
30% by midterm exam	1, 2
55% by final exam	1, 2

c. All records of grades will be put on Canvas as soon as they are available. This course is essentially graded by the absolute marks received in the above assessment. This course is essentially graded by the absolute grading scheme (with discretions)

Grade	Thresholds (Guaranteed score to get the grade)
A+	95 % or above
A Range	85 % or above
B Range	65 % or above
C Range	50 % or above
Passing Grade	40 % or above

If your overall course percentage is more than the mentioned thresholds, you will be guaranteed to get the corresponding grade (or grade range). If you score below the threshold but hope to get a better grade, your case will be subjected to our discretion by considering your performance.

d. Students should submit homework to Canvas before deadline.
e. If you are absent from the midterm due to sickness with a valid proof, the weight of your scores will be shifted to final, i.e. 85% Final, 0% Midterm. Invalid reasons for absence will make your midterm 0 marks.

7. Learning Resources

Major reference: lecture notes/lecture slides prepared by the instructor

Useful references textbook: Principles of Mathematical Analysis, by Walter Rudin, 3$^{nd.}$ Edition

All course related materials will be available on Canvas, all the course related announcements will be made on Canvas.

8. Learning Activities

Lectures: The instructor will focus on illustrating the concepts, the main theorems and the essential math ideas of the course.

Tutorials: TA will focus on examples and problem-solving skills.

9. Homework and Class Participation

Homework: A set of problems for each chapter will be assigned on canvas with specified due date. Each student is required to submit answer to Canvas before the due date. The TAs will grade the answers and marks will be given which counts to the total grade.

Class participation: Classwork will be given through GeoGebra during the lesson and students need to do them to get the class participation marks.

10. Course Schedule (Tentative)

Key word Syllabus

- Preliminary knowledge (1 week)

  Review the materials from MATH 2033 that are essential for this course.

- Point-Set Topology (2 weeks)

  The metric in R^n, open sets, closed sets, structure theorem of open set in the real line, compact sets.

- Vector-valued Functions (4 weeks)

  Review on linear transformations in R^n; Continuity and differentiation of vector-valued functions; mean-value inequality, Contraction mapping theorem, the inverse function theorem, the implicit function theorems.

- Sequences and Series of Functions (4 weeks)

  Convergence of sequence, uniform convergence of series of functions; continuity, integration, and differentiation theorem for function series.

- Lebesgue Measure and Integration (2 weeks)

  Lebesgue measure on the real line, Lebesgue integral; Convergence theorems.