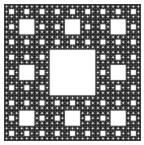

MATH 3043
Honors Real Analysis
2025-26 Fall

https://canvas.ust.hk/courses/66238

Lecture

Time	Tuesdays and Thursday 4:30pm - 5:50pm
Venue	Room 2463
Instructor	**Prof. Frederick Tsz-Ho FONG**
E-mail	frederick.fong@ust.hk
Office	Room 3425, Department of Mathematics

Tutorial

Time	Tuesdays 7:00pm - 7:50pm
Venue	Room 2404
Teaching Assistant	**Ana KAZOVSKAIA**
E-mail	akazovskaia@connect.ust.hk

Course Description

Course outline: The course is the continuation of MATH 2043. Topics include: Lebesgue measures, measure spaces, Lebesgue integrals, convergence theorems, product measures, Fubini's theorem, absolute continuity, bounded variations, Rademacher's Theorem, area and co-area formulae, signed measures, Radon-Nikodym's theorem.

Credits: 4

Prerequisites: A- or above in MATH 2043, or instructor's approval.

Intended Learning Outcomes (ILOs)

Upon completion of this course, students are expected to:

(1) understand the fundamental concepts in the measure theory;
(2) be equipped with workable knowledge in real analysis for further studies and research in partial differential equations, geometric analysis, probability theory and related fields.
(3) develop logical reasoning and critical thinking skills.

Course Website

Canvas will be used as the course website. The link can be found on top of the page. Lecture notes, homework, solutions, and sample exams will be posted there. Students should visit the course website regularly to check up new announcements and new materials.

Student Learning Resources

References:

(1) *Real Analysis: Measure Theory, Integrations, & Hilbert Spaces* by Stein and Shakarchi
(2) *Real Analysis* by Royden and Fitzpatrick
(3) *Measure Theory and Fine Properties of Functions* by Evans and Gariepy
(4) *Geometric Measure Theory: An Introduction* by Fanghua Lin and Xiaoping Yang

GRADING

Homework: There will be 4 or 5 problem sets. Students should submit each homework in form of a clearly written and scanned or a LaTeX-typed PDF on the Canvas system before the deadline. The due time of Canvas is sharp. No late homework is accepted. You can form a group of at most three students to work on the homework together, and submit one copy of the homework as a team. All team members in the same group will receive the same score.

Examinations: There will be a 3-hour midterm exam during Week 6-8 (exact date to be confirmed), and a 3-hour final exam arranged by ARO.

Make-up midterm policy:

- Under any circumstance, no make-up midterm test would be offered after the regular exam session.
- For students who have valid reasons for missing the midterm (such as time crash with another midterm), the instructor may approve an early midterm, or assign the midterm marks according to the final exam performance.
- On the other hand, for students who miss the midterm without a valid reason, the midterm score will be regarded as 0. This includes self-claimed sickness without any medical statement.

Make-up final exam policy:

For final exams, the course will follow the make-up exam policy set by ARO. Approval from the instructor, the dean, and ARO will be needed for applying for a make-up final exam, and students need to complete the make-up final exam within 1 week after the approval decision from ARO. In any circumstance, the make-up final exam will use a different set of problems, and there is no guarantee that the level of difficulty remains the same as the regular sitting.

Grading Scheme:

Total score
$= \sup\{\lambda\,\text{homework} + \mu\,\text{midterm} + \nu\,\text{final} : \lambda \in [0, 0.2], \mu \in [0, 0.4], \nu \in [0.4, 0.7], \lambda + \mu + \nu = 1\}.$

Grading Scheme: This course will be assessed using **criterion-referencing**, and grades will **not** be assigned using a curve (or on any measurable set). Try to aim at getting a total of 75% or above for an A-/A0/A+ grade, and about 50% or above for a B-/B/B+ grade.

Grade Descriptors:

Grades	Short Description A	Elaboration on subject grading description
A	Excellent Performance	The student has mastered almost all concepts and techniques of mathematical analysis taught in the course, has excellent understanding of the deepest content of the subject, and acquired workable knowledge for further studies of functional analysis, PDE, and related fields.
B	Good Performance	The student has mastered most techniques of mathematical analysis 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 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 problems.
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 problems.

Course AI Policy

Students are allowed to consult any person (including the instructor, TA, classmates, friends outside HKUST) in any homework for ideas and hints, but are required to write up the solutions by themselves. You are required to **list the persons and references** you have consulted in every homework.

The use of ChatGPT or other generative AI is allowed, and they are regarded as "persons" you have consulted, and therefore must be listed in your homework.

However, please be warned that at the current stage of development of AI, the response to problems in advanced courses – especially those in pure mathematics – is not quite reliable. Students should be critical of the response generated by AI and do not blindly copy the generated responses to your homework.