

MATH 4991 – Capstone Project in Pure Mathematics

Spring 2025 Course Syllabus

Course Coordinators

Course Coordinator:	Prof. IP, Ivan Chi-Ho	TA	Tai, Sung Chit
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Meeting Time and Venue

Lecture:	Monday, Wednesday	12:00 – 13:20	Room 1410
Tutorial:	Tuesday	17:00 – 17:50	Room 4504

Instructors

Instructor: Prof. IP, Ivan Chi-Ho
E-mail: ivan.ip@ust.hk
Topics: Introduction to Cluster Algebra

Instructor: Prof. XIONG, Maosheng
E-mail: mamsxiong@ust.hk
Topics: Introduction to Information Theory

Instructor: Prof. MENG, Guowu
E-mail: mameng@ust.hk
Topics: Great Ideas in Mathematics

Instructor: Prof. HO, Quoc
E-mail: maqho@ust.hk
Topics: Introduction to Category Theory

Course Description

This is a project-based course that provides students an opportunity to integrate and apply mathematical tools to analyze problems in pure mathematics. Specific topics will be chosen by the four assigned faculty instructors. The first 8 weeks are lecture-based, while the last 6 weeks are done via individual meetings with the supervisors.

For MATH students in their last year of study only.

Prerequisite: MATH 3121 OR MATH 3131
Exclusion: MATH 4992, MATH 4993, MATH 4994, MATH 4999
Credits: 3

Intended Learning Outcomes

Upon completion of this course, students are expected to:

1. Be able to learn advanced materials beyond usual undergraduate curriculum.
2. Be able to work together as a research group to go over research-level materials.
3. Be able to present their finding in a professional way, and write professional mathematical report.

Assessment and Grading

Grading Scheme. This course will be assessed using **criterion-referencing** and grades will **not** be assigned using a curve. The assessment consists of

- **Attendance (15%).** Students are required to attend the lectures offered by the instructors, the special lectures on presenting mathematics, and the group presentations.
- **Participation (10%).** Students should actively participate in the individual meetings with the supervisor.
- **Group Presentation (35%).** Weighted scores are awarded to a group of 3-4 students by the professors (20%), the TA (5%) and fellow classmates (10%).
- **Final Report (40%).** Weighted scores based on the mathematical content (20% graded by supervisor) and the editorial styles (20% graded by TA) of the report.

Letter Grades. Letter grades will be assigned depending on overall performance.

Obtaining a total point of 85% or above will guarantee an A-range.

Obtaining a total point of 70% or above will guarantee a B-range.

Obtaining a total point of 50% or above will guarantee a passing grade.

Grades	Short Description	Elaboration on subject grading description
A	Excellent Performance	Be able to understand and present pure mathematics topics in a professional way.
B	Good Performance	Shows good knowledge and understanding of advanced pure mathematics topics, but could not provide a perfect presentation of the subject.
C	Satisfactory Performance	Possesses adequate knowledge of advanced pure mathematics topics, but could not provide a good presentation of the subject.
F	Fail	The student does not participate well enough and spend effort in understanding advanced pure mathematics topics.

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. Please refer to Academic Integrity — HKUST – Academic Registry for the University's definition of plagiarism and ways to avoid cheating and plagiarism.

Communication and Feedback. Assessment marks for group presentation is immediate. Feedback on the Final Report will be communicated via Canvas within two weeks of submission.

Course AI Policy. The use of Generative AI is **NOT** permitted in this course. Students should write their own presentation slides and final report.

Student Learning Resources

Lecture Slides or Notes provided by the instructors, and **RVC Video** recordings.

Tentative Schedule

Week 1–2	Lecture by Ivan Ip Special Lecture on Working with L ^A T _E X
Week 3–4	Lectures by Maosheng Xiong Special Lecture on Preparing Beamer Slides
Week 5–6	Lectures by Guowu Meng Special Lecture on Preparing Final Report
Week 7–8	Lectures by Quoc Ho
Week 9–14	Individual Meetings
Study Break	Final Presentations