Course offerings 2024-2025

Requirements:
MPhil students: SSAF6001, MATH6001 and 3 elective courses
PhD students: SSAF6001, MATH6001 and 4 elective courses
For students enrolled before Jan 2015: SSAF6001, 1 compulsory and 3 elective courses

Courses offered - Full Year

Course Code	Course Title	Compulsory / Elective	Remarks
SSAF6001	Basic Laboratory Safety Course for RPg Candidate in the Faculty of Science	Compulsory	1st sem: October 18, 2024 (Friday) PM at CYPP2 2nd sem: March 13, 2025 (Thursday) PM at CYPP2
MATH6001	Guided Study in Mathematics	Compulsory	
MATH6002	Selected Topics in Mathematics	Elective	
MATH6903	Independent Studies	Elective	

Courses offered - Semester 1, 2024-2025

Course Code	Course Title	Compulsory / Elective	Instructor	Class Schedule	Venue
MATH6014	Topics in Advanced Numerical Analysis	Elective	Prof. Zhiwen Zhang	Fri: 17:30 – 20:20	KKLG104
MATH6219	Topics in Applied Functional Analysis	Elective	Prof. Dong Li	Thu: 13:30 – 16:20	MW103
MATH6224	Topics in Advanced Probability Theory	Elective	Prof. Guangyue Han	Tue: 15:30 – 16:20 Fri: 15:30 – 17:20	LE1
MATH6501	Topics in Algebra	Elective	Prof. Zheng Hua	Wed: 09:30 - 12:20	JLG01
Joint Centre for Advanced Study Courses (JCAS)					
MATH6101	Intermediate Complex Analysis	Elective	Prof. Ngaiming Mok	Wed: 13:30 - 16:20	RR210
MATH6104	Abstract Algebra (CUHK: MATH5051 Abstract Algebra I	Elective	Prof. Jiu Kang Yu	Tue: 15:30 – 17:15 Thu: 10:30 – 11:15	Rm 501A, Academic Bldg. I, CUHK
MATH6204	Topics in Partial Differential Equations (CUHK: MATH5021 Theory of Partial Differential Equations I)	Elective	Prof. Chenyun Luo	Thu: 14:30 - 17:15	Rm 222, Lady Shaw Bldg., CUHK
MATH6208	Topics in Numerical Analysis (CUHK: MATH6221 Topics in Numerical Analysis I)	Elective	Prof. Bangti Jin	Mon: 9:30 - 12:15	Rm 222, Lady Shaw Bldg., CUHK

Courses offered - Semester 2, 2024-2025

Course Code	Course Title	Compulsory / Elective	Instructor	Class Schedule	Venue
MATH6015	Topics in Artificial Intelligence and Machine Learning	Elective	Prof. Yunwen Lei	Wed: 18:30 - 21:20	KB223
MATH6502	Topics in Applied Discrete Mathematics	Elective	Prof. Wenan Zang	Tue: 12:30 – 13:20 Fri: 12:30 – 14:20	MB141
MATH6503	Topics in Advanced Optimization	Elective	Prof. Xiaoming Yuan	Fri: 17:30 - 20:20	KK202
MATH6505	Real Analysis	Elective	Prof. Chun Yin Hui	Mon: 09:30 – 11:20; Thu: 09:30 – 10:20	KKLG107
Joint Centre for Advanced Study Courses (JCAS)					
MATH6215	Applied Differential Equations (CUHK: MATH5022 Theory of Partial Differential Equations II)	Elective	Prof. Yong Yu	Tue: 9:30 - 11:00; Thu: 9:30 - 11:00	Rm 222, Lady Shaw Bldg., CUHK

Joint Centre for Advanced Study (JCAS)
Term 1, 2024-25
(2 September 2024 – 30 November 2024)

HKU matching code: MATH6204

MATH5021

Theory of Partial Differential Equations I
by
Professor Chenyun LUO

Schedule: Thursday, 2:30pm – 5:15pm
Venue: Room 222, Lady Shaw Building, CUHK

Course outline

We will discuss the classical theory of hyperbolic PDEs. Topics include linear hyperbolic equations, Lorentzian geometry, semilinear and quasilinear wave equations, Einstein's equations for general relativity.

Department of Mathematics
The Chinese University of Hong Kong

數學系
香港中文大學

Joint Centre for Advanced Study (JCAS)
Term 1, 2024-25
(2 September 2024 – 30 November 2024)

HKU matching code: MATH6104

MATH5051

Abstract Algebra I
by
Professor Jiu Kang YU

Schedule: Tuesday, 3:30pm – 5:15pm &
Thursday, 10:30am – 11:15am
Venue: Room 501A, Academic Building I, CUHK

Course outline

This course may cover selected topics in Abstract Algebra in the graduate level, such as category theory, Galois theory, simple algebras, homological algebras and commutative algebras.

Reference books:
Lang: Algebra
Bourbaki: Algebra

Department of Mathematics
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數學系
香港中文大學

Joint Centre for Advanced Study (JCAS)
Term 1, 2024-25
(2 September 2024 – 30 November 2024)

HKU matching code: MATH6208

MATH6221

Topics in Numerical Analysis I
by
Professor Bangti JIN

Schedule: Monday, 9:30am – 12:15pm
Venue: Room 222, Lady Shaw Building

Course outline

This course provides an introduction to computational inverse problems, e.g., practical inverse problems in medical imaging (e.g., computed tomography and impedance tomography), and various numerical methods for solving inverse problems, e.g., variational regularization (including both classical Tikhonov and sparsity regularization), iterative regularization techniques, and data-driven techniques. The emphasis is on developing computational techniques and relevant mathematical theory.

The prerequisite for taking the course includes basic linear algebra, mathematical analysis, and functional analysis. Some basic knowledge of differential equations and optimization will be helpful.

There will be a final examination.
Grade: The grade will be determined by the final exam.

Reference books:
1. Simon Arridge, Peter Maass, Ozan Oktem, Carola Schonlieb. Solving inverse problems using data-driven models. Acta Numerica 2019;28: 1-174.
2. Bangti Jin, Kazufumi Ito. Inverse Problems: Tikhonov Theory and Algorithms. World Scientific Press, Singapore, 2015
3. Andreas Kirsch. An Introduction to the Mathematical Theory of Inverse Problems. Volume 120 of Applied Mathematical Sciences. Springer, New-York, third edition, 2021.

Department of Mathematics 數學系
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Joint Centre for Advanced Study (JCAS)
Term 2, 2024-25
(6 January 2025 – 17 April 2025)

HKU matching code: MATH6215

MATH5022

Theory of Partial Differential Equations II
by
Professor Yong YU

Schedule: Tuesday, 9:30am – 11:00am and
             Thursday, 9:30am – 11:00am
Venue: Room 222, Lady Shaw Building

Course outline

This course introduces basic theories on elliptic partial differential equations. The topics include: Classic theories on harmonic functions, Maximum principles, W2,p estimate (Calderon-Zygmund theory), Schauder estimate, and De Giorgi-Nash-Moser estimate. If time permits, the following special topics will also be introduced: Regularity theories on harmonic maps, Dirichlet eigenvalue problems, Steklov eigenvalue problems, and Related topics on Stokes operator.

The course will be evaluated by final exam (50%) and students' presentation on some selected topics (50%).

Reference:
- Fanghua Lin and Qing Han: Elliptic partial differential equations second editions
- Gilbarg and Trudinger: Elliptic partial differential equations of second order
- Ambrosio: lectures on elliptic partial differential equations
- Fanghua Lin and Changyou Wang: The analysis of harmonic maps and their heat flows
- Leon Simon: Regularity theory for harmonic maps