



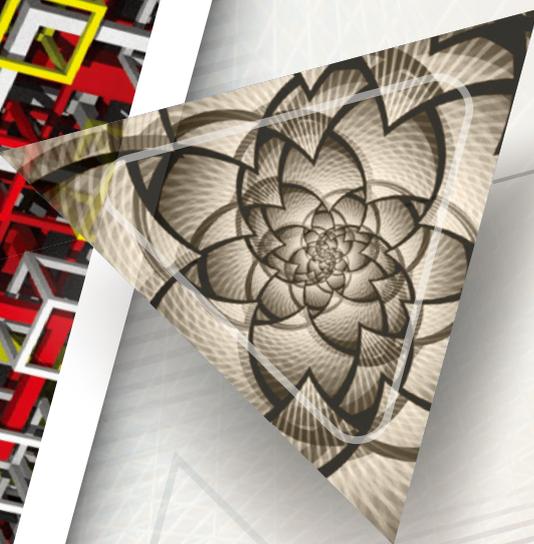
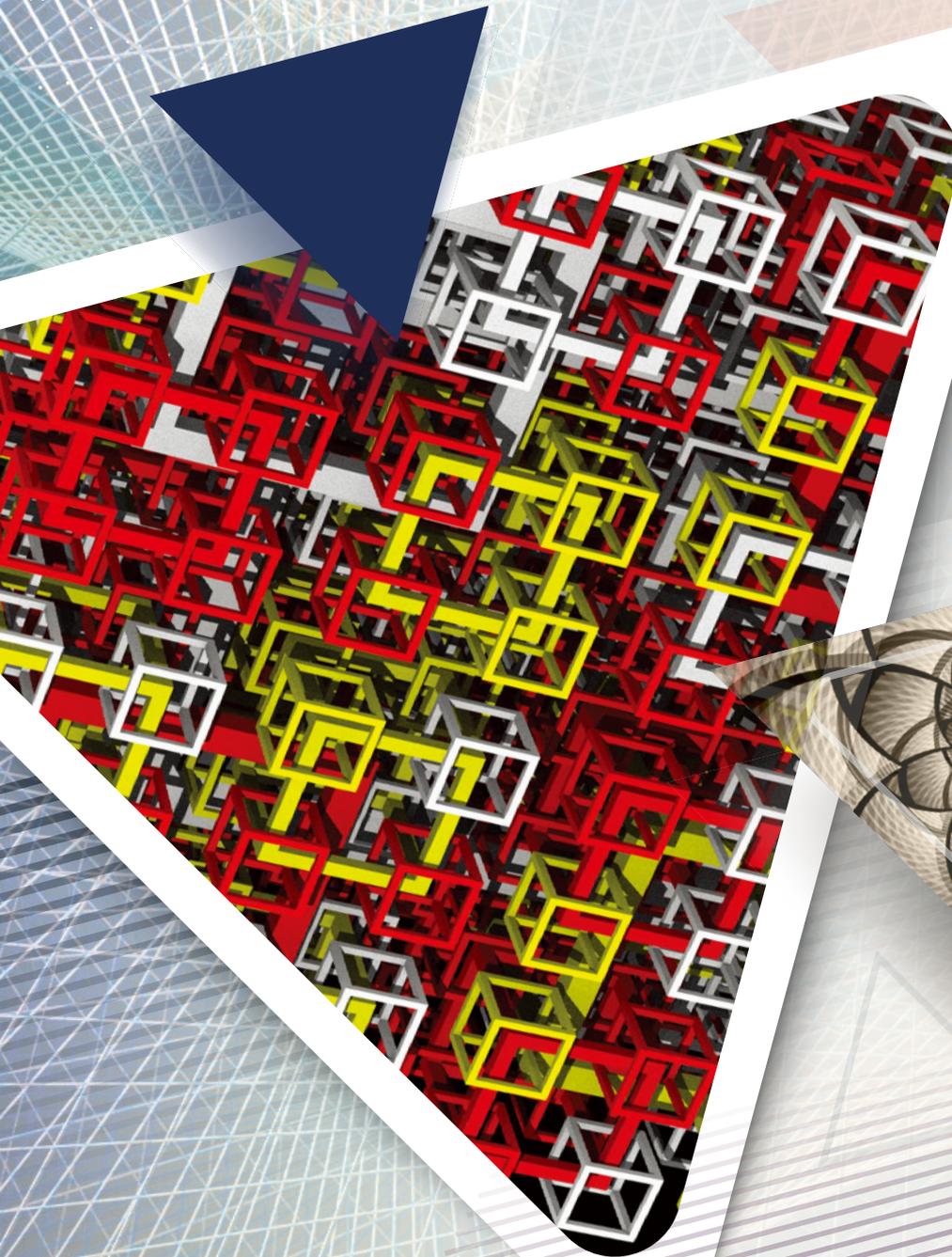
Department of Mathematics

香港城市大學  
City University of Hong Kong

# Applied Mathematics

## Doctor of Philosophy (PhD)

2024 Entry



# Doctor of Philosophy (PhD)

Website: <https://www.cityu.edu.hk/ma/programmes/postgraduate/master-of-philosophy-MPhil>

## Programme Aims

The research degree programme aims to provide advanced education to nurture people who can:

- contribute to the advancement of knowledge through independent and original research;
- demonstrate specialist subject knowledge and a high level of transferable skills, including analytical, communication and leadership skills; and
- enhance economic, social and cultural development.

## Programme Structure

The research degree programme consists of both coursework and independent research studies culminating in the submission of a thesis.

### Coursework Requirements

Students are required to fulfill the coursework requirements of 14 credit units (including at least 9 credit units of core courses and at least 2 credit units of research methodology and ethics course at postgraduate level) together with a compulsory 1 credit unit course (SG8001 – Teaching Students: First Steps) within their study period. Individual students with insufficient English proficiency may be required to take a 1 credit unit course “English for the Medium of Instruction” (SG8002) before they are allowed to enrol into SG8001. The credit unit earned for SG8001 and SG8002 will not be counted towards the minimum coursework requirements.

### Qualifying Examination

Full-time PhD students are required to take and pass a written qualifying examination within 10-24 months after commencement of PhD studies. The examination aims to test students’ knowledge of major subject area of their research disciplines and assess their readiness to conduct research in their specific research discipline. A maximum of two attempts will be allowed. Those who fail the qualifying examination after two attempts will be recommended for termination of study.

### Thesis

A PhD thesis should present the results of research investigation, give evidence of a sound understanding of the area of study, its context and applicability, make a contribution to knowledge, and make a substantial original contribution to knowledge in the subject area concerned.

Period of Study	Full-time
PhD (students with a bachelor’s or a master’s degree)	4 years

## Entrance Requirements

Applicants seeking admission to PhD studies at CityU should satisfy the following minimum entrance requirements:

- be a current MPhil student in the University who seeks transfer to PhD candidature; or
- hold a higher degree by research (or equivalent qualification) from a recognised university; or
- hold a Master's degree (or equivalent qualification) from a recognised university; or
- hold a Bachelor's degree with first class honours (or equivalent qualification) from a recognised university.

Equivalent qualifications mentioned above include relevant professional qualifications or other scholarly achievements recognised by the University.

## English Proficiency Requirements

Applicants from an institution where the language of teaching is not English should satisfy the minimum English proficiency requirements specified by both the University and the College of Science:

- a minimum total score of 550 (paper-based test) or 79 (internet-based test); or 59 (revised paper-delivered test; sum of Reading, Listening and Writing section scores) in TOEFL; or
- a minimum IELTS score of 6.5; or
- other test scores that may be regarded as equivalent to TOEFL 550 (paper-based) or 79 (internet-based); or 59 (revised paper-delivered test); or
- a minimum score of 490 in the Chinese mainland's College English Test Band 6 may be accepted.

\* TOEFL and IELTS scores are considered valid for two years from the test date and must be valid at the time of submission of application to CityU.

## Admissions Handbook

Detailed information about application, tuition fees, programme related fees, application procedures, financial awards/assistance and admission related matters can be obtained from the Admissions Handbook of Chow Yei Ching School of Graduate Studies.

<https://www.cityu.edu.hk/sgs/files/prospective/rpg/handbook.pdf>

# Research Areas for PhD Programme

## Applied Mathematics

### *Department of Mathematics*

#### Background

The Department of Mathematics was formed in September 1991 and is part of the College of Science at City University of Hong Kong (CityU). The Department has strong mission to provide high quality education in mathematics and conduct first-class research in applied mathematics. We are striving for excellence in both teaching and research in applied mathematical sciences.

#### Programmes

The Department offers a wide range of programmes at both undergraduate and postgraduate levels. Over the past years, our research degree programme has successfully nurtured young mathematicians of great potential, and has earned international recognition.

#### Faculty

The Department possesses a strong team of faculty members, including Chair Professors, Professors, Associate Professors and Assistant Professors. The Department benefits from the increased research strength at all levels among faculty members.

Our faculty members have a strong background in applied mathematics. They are active researchers engaging in high impact and high quality research projects, producing publications in top international journals, serving editorial boards of a number of leading international journals, and receiving research grants and honors. Some faculty members belong to one or more of the national mathematics organizations. They are playing leading roles and recognised in their professional societies locally and internationally.

In addition, two renowned mathematicians, Professor Stephen Smale and Professor Philippe G. Ciarlet, are currently Senior Fellows of Hong Kong Institute for Advanced Study at CityU. They are academicians and fellows of various significant academies. Professor Smale is also a winner of Fields Medal and Wolf Prize.

#### Research

Research is one of the major functions of the Department, and a considerable amount of emphasis has been placed on this area. The Department's excellent achievements in research are evidenced by its performance in the General Research Fund (GRF) exercises and the Research Assessment Exercises (RAE). Our faculty's research interests cover a wide range of topics in applied mathematics. Apart from having substantial teaching experience, faculty members are active researchers with a high profile in terms of international reputation, publications and funded research projects.

Research strengths/disciplines of the Department include:

- (1) Applied Analysis: approximation theory, asymptotic analysis, harmonic analysis, inverse problems, kinetic theory, learning theory, partial differential equations, random matrix theory, and special functions;
- (2) Computational Mathematics: complexity theory, computational electromagnetics, image processing, numerical analysis, numerical linear algebra, and scientific computing;
- (3) Mathematical Modelling: control and system theory, fluid mechanics, general relativity, granular materials, mathematical biology, mathematical elasticity, mathematical finance, mathematical modeling of waves, and mathematics of new materials;
- (4) Probability and Statistics: Bayesian statistics, high dimensional data analysis, mean field games, probability theory, statistical learning theory, stochastic analysis, stochastic controls, and stochastic processes.

The above research topics are among the most important ones in applied mathematics.

The Department is among the top in the region. It has renowned research reputation and earned great recognition internationally.

#### **Departmental Research Degree Coordinator:**

##### **Dr. Shun ZHANG**

Associate Professor  
Department of Mathematics  
City University of Hong Kong

Phone no. 3442 9931  
Fax no. 34420250  
Email [shun.zhang@cityu.edu.hk](mailto:shun.zhang@cityu.edu.hk)

# Hong Kong PhD Fellowship Scheme at City University of Hong Kong

## Introduction

The Hong Kong PhD Fellowship Scheme <https://cerg1.ugc.edu.hk/hkpfs/index.html>, established by the Research Grants Council (RGC) of the HKSAR government, aims at attracting the best and brightest students in the world to pursue their PhD studies in Hong Kong's universities.

<https://www.cityu.edu.hk/pg/hong-kong-phd-fellowship-scheme>

## Funding and Scholarship

The Fellowship provides awardees with a monthly stipend of HK\$27,100 (~US\$3,474) and a conference and research related travel allowance of HK\$13,600 (~US\$1,744) per year for a maximum of three years.

In addition, CityU will award each successful Fellowship recipient the *Chow Yei Ching School of Graduate Studies Entrance Scholarship* at a value of HK\$89,496 (~US\$11,473) which covers the student's full-time tuition fees and on-campus hostel accommodation expenses in the first year of research study, and a full stipend to support the fourth year of the student's PhD study. Various types of financial support will also be provided to eligible students to undertake research related activities and to attend international academic conferences.

## Application procedures

### Step one

Applicants should first register on the RGC's Online Application System (OAS) <https://cerg1.ugc.edu.hk/hkpfs/InitApplication.jsp> and obtain a RGC reference number on or before RGC's deadline (around early December each year).

### Step two

Applicants are then required to submit a full application, together with supporting documents to CityU's Online Admission Application System at [www.cityu.edu.hk/sgs/oas](http://www.cityu.edu.hk/sgs/oas), and quote the RGC reference number, on or before CityU's deadline (around early December each year).

## Application deadline for 2024-25 entry

RGC's deadline: to be announced in [www.rgc.edu.hk/hkphd](http://www.rgc.edu.hk/hkphd)

CityU's deadline: to be announced in <https://www.cityu.edu.hk/pg/hong-kong-phd-fellowship-scheme>

*Application results of Hong Kong PhD Fellowship 2024-25 will be announced by RGC in March 2024.*

*Firm admission offer with regular postgraduate studentship will be given to selected CityU's nominees, even if they are not awarded the Fellowship by the RGC.*

# Faculty Members with Research Interests

## Chair Professors

### Prof. Raymond CHAN (陳漢夫)

Dean of College of Science and Chair Professor

#### Research Interests

- Numerical Linear Algebra
- Image Processing
- Financial Mathematics

### Prof. Daniel W. C. HO (何永昌)

Associate Dean of College of Science and Chair Professor

#### Research Interests

- Control Theory
- Estimation and Filtering Theory
- Complex Dynamical Distributed Networks
- Multi-agent Networks
- Nonlinear Singular Systems
- Stochastic Systems

## Professors

### Dr. Heng LIAN (練恒)

Professor

#### Research Interests

- High-dimensional Data Analysis
- Machine Learning
- Functional Data Analysis
- Bayesian Statistics

### Prof. Hongyu LIU (劉宏宇)

Professor

#### Research Interests

- Inverse Problems
- Wave Propagation
- Partial Differential Equations
- Mathematical Material Science
- Scattering Theory
- Spectral Theory

### Prof. Ya Yan LU (陸雅言)

Head of Department of Mathematics and Professor

#### Research Interests

- Wave Propagation (Optics and Acoustics)
- Scientific Computation

### Prof. Tao LUO (羅濤)

Professor

#### Research Interests

- Nonlinear Partial Differential Equations in Fluid Mechanics
- Mathematical Analysis of PDEs of Fluid Dynamics
- Fluids Free Boundary Problems
- Hyperbolic Conservation Laws
- Calculus of Variations

### Prof. Jonathan J. WYLIE

Professor

#### Research Interests

- Fluid Mechanics
- Granular Materials
- Suspension Mechanics
- Mathematical Modelling of Geophysical Systems

## Associate Professors

### Dr. Dan DAI (代丹)

Associate Professor

#### Research Interests

- Asymptotic Analysis
- Orthogonal Polynomials and Special Functions
- Integrable Systems
- Random Matrix Theory
- Riemann-Hilbert Problems

### Dr. Wing Cheong LO (羅永昌)

Associate Professor

#### Research Interests

- Feedback Control of Stem Cell Lineages
- Morphogen-mediated Patterning
- Cell Polarization
- Inflammatory Disease and Cancer Modeling
- Numerical Methods for Reaction-diffusion System

### Dr. Pierre NOLIN

Associate Professor

#### Research Interests

- Probability Theory
- Stochastic Processes
- Statistical Mechanics

### Dr. Frederick W.F. QIU (邱蔚峰)

Associate Professor

#### Research Interests

- Scientific Computing
- Numerical Analysis for Partial Differential Equations

### Dr. Wei XIANG (向偉)

Associate Professor

#### Research Interests

- Nonlinear Hyperbolic Conservation Laws and Multidimensional Shock Waves
- Nonlinear Equations of Hyperbolic-Elliptic Mixed Type
- Mathematical Theory of Fluid Mechanics

### Dr. Shun ZHANG (章順)

Associate Professor

#### Research Interests

- Scientific Computing
- Numerical Analysis

**Dr. Xiaosheng ZHUANG ( 莊曉生 )**

*Associate Professor*

**Research Interests**

- Applied and Computational Harmonic Analysis
- Machine Learning, Deep Learning and Pattern Recognition
- Sparse Approximation and Directional Multiscale Representation Systems
- Image/Signal Processing
- Compressed Sensing

**Assistant Professors**

**Dr. Han FENG ( 馮寒 )**

*Assistant Professor*

**Research Interests**

- Harmonic Analysis
- Approximation Theory
- Learning Theory

**Dr. Yukun HE ( 何煜坤 )**

*Assistant Professor*

**Research Interests**

- Probability
- Random matrix theory

**Dr. Jongchon KIM**

*Assistant Professor*

**Research Interests**

- Harmonic Analysis
- Partial Differential Equations

**Dr. Wing Tat LEUNG ( 梁永達 )**

*Assistant Professor*

**Research Interests**

- Numerical Analysis
- Multiscale Method
- Model Reduction

**Dr. Laurent MERTZ**

*Assistant Professor*

**Research Interests**

- Applied Mathematics
- Probability Theory
- Modelling and Simulation

**Dr. Chenchen MOU ( 牟宸辰 )**

*Assistant Professor*

**Research Interests**

- Mean Field Games
- Stochastic Controls and Games
- Mathematical Finance
- Stochastic Analysis

**Dr. Wei QIAN ( 錢瑋 )**

*Assistant Professor*

**Research Interests**

- Probability Theory
- Random Geometry
- Statistical Physics
- Complex Analysis

**Dr. Moritz A. REINTJES**

*Assistant Professor*

**Research Interests**

- Mathematical Physics
- Partial Differential Equations
- General Relativity
- Fluid Dynamics and Shock Waves
- Quantum Mechanics

**Dr. Panpan REN ( 任盼盼 )**

*Assistant Professor*

**Research Interests**

- Stochastic Analysis
- McKean Vlasov Stochastic Differential Equation
- Non-linear Fokker Planck Equation

**Dr. Lina ZHAO ( 趙利娜 )**

*Assistant Professor*

**Research Interests**

- Numerical Analysis & Scientific Computation
- Numerical Methods for PDEs
- Flows in (fractured) Porous Media
- Unfitted Methods for Multi-subdomain Problem
- Various Aspects of Polygonal Methods
- Deep Learning for Numerical PDEs

