Applied Mathematics

Doctor of Philosophy (PhD)

2022 Entry
Doctor of Philosophy (PhD)

Website: http://www6.cityu.edu.hk/ma/pg/mphilphd/general.htm

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 1 credit unit compulsory course (SG8001 – Teaching Students: First Steps) and Training on Research Integrity (CITI Programme) within their study period.

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

48 months (full-time)
**Entrance Requirements**

Applicants seeking admission to the research degree programme 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 recognized university; or
- hold a Master’s degree (or equivalent qualification) from a recognized university; or
- hold a Bachelor’s degree with first class honors (or equivalent qualification) from a recognized university.

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

**Programme of Study**

<table>
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<tr>
<th>Programme of Study</th>
<th>Full-time</th>
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<tr>
<td>PhD (students with a bachelor’s or a master’s degree)</td>
<td>4 years</td>
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**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 overall band score of 6.5 in IELTS; or
- other test scores that may be regarded as equivalent to TOEFL 550 (paper-based test) or 79 (internet-based test); 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.

**Tuition Fee**


**Admissions Handbook**

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

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 University Distinguished Professor, 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 their national mathematics organizations. They are playing leading roles and recognized in their professional societies locally and internationally.

In addition, two renowned mathematicians, Professor Stephen Smale and Professor Philippe Ciarlet, are currently Senior Fellows of 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:

2. Computational Mathematics: complexity theory, numerical linear algebra, numerical analysis, scientific computation, computational electromagnetics and image processing;
3. Mathematical Modelling: control and system theory, fluid mechanics, elasticity, granular materials, mathematical biology, mathematical finance, mathematics of new materials, plate and shell theory, general relativity and quantum field theory;

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:
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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](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 programmes in Hong Kong’s institutions. [https://www.cityu.edu.hk/pg/hong-kong-phd-fellowship-scheme](https://www.cityu.edu.hk/pg/hong-kong-phd-fellowship-scheme)

Funding and Scholarship
The Fellowship provides awardees with a monthly stipend of HK$26,900 (~US$3,449) and a conference and research related travel allowance of HK$13,500 (~US$1,731) 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$85,296 (~US$10,935) which covers the student’s full-time tuition fees and on-campus hostel accommodation expenses in the first year of research study, and will provide a full stipend to support the fourth year of the student’s PhD study. Various types of financial support will also be offered to eligible students to undertake research related activities and to attend international academic conferences.

Application procedures

*Step one*
Applicants should first submit an initial application at the RGC’s Online Application System (OAS) [https://cerg1.ugc.edu.hk/hkpfs/InitApplication.jsp](https://cerg1.ugc.edu.hk/hkpfs/InitApplication.jsp) and to obtain a RGC reference number on or before RGC’s deadline (around early December each year).

*Step two*
Applicants are then required to submit full application, together with supporting documents to CityU’s Online Admission 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 2022-23 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](https://www.cityu.edu.hk/pg/hong-kong-phd-fellowship-scheme)

Application results of Hong Kong PhD Fellowship 2022-23 will be announced by RGC in March 2022.

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. Daniel W. C. HO (何永昌)
*Acting Head of Department and Chair Professor*
Research Interests
- Control Theory
- Estimation and Filtering Theory
- Complex Dynamical Distributed Networks
- Multi-agent Networks
- Nonlinear Singular Systems
- Stochastic Systems

Prof. Raymond CHAN (陳漢夫)
*Vice-President of Student Affairs and Chair Professor*
Research Interests
- Numerical Linear Algebra
- Image Processing
- Financial Mathematics

Prof. Felipe CUCKER
*Chair Professor*
Research Interests
- Complexity and Computation

Prof. Tong YANG (楊彤)
*Chair Professor*
Research Interests
- Partial Differential Equations
- Kinetic Theory

University Distinguished Professor

Prof. Philippe G. CIARLET
*University Distinguished Professor*
*Senior Fellow of Institute for Advanced Study*
Research Interests
- Numerical Analysis
- Finite Element Method
- Computational Mechanics
- Mathematical Elasticity
- Intrinsic Elasticity
- Plate Theory
- Shell Theory
- Applied Differential Geometry
- Korn Inequalities

Professors

Prof. Benny Y. C. HON (韓耀宗)
*Professor*
Research Interests
- Kernel-Based Approximation
- Meshless Computation
- Inverse Problems
- Integrable Systems
- Gifted Education

Prof. Hongyu LIU (劉宏宇)
*Professor*
Research Interests
- Kernel-Based Approximation
- Meshless Computation
- Inverse Problems
- Integrable Systems
- Gifted Education

Prof. Ya Yan LU (陸雅言)
*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

Prof. Cristinel MARDARE
*Professor*
Research Interests
- Mathematical Elasticity
- Differential Geometry
- Functional Analysis

Prof. Jonathan J. WYLIE
*Professor*
Research Interests
- Fluid Mechanics
- Granular Materials
- Suspension Mechanics
- Mathematical Modelling of Geophysical Systems

Associate Professors

Dr. Kwok Wai CHUNG (宗國威)
*Associate Professor*
Research Interests
- Dynamical System
- Nonlinear Dynamics
- Limit Cycles
- Bifurcation
- Chaos
- Generation of Symmetrical Patterns

Dr. Dan DAI (代丹)
*Associate Professor*
Research Interests
- Asymptotic Analysis
- Special Functions, Orthogonal Polynomials
- Riemann-Hilbert Problems
Dr. Xianpeng HU (胡先鹏)
*Associate Professor*
Research Interests
- Partial Differential Equations

Dr. Heng LIAN (练恒)
*Associate Professor*
Research Interests
- High-dimensional Data Analysis
- Bayesian Statistics
- Functional Data Analysis

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 (向伟)
*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 (章顺)
*Associate Professor*
Research Interests
- Scientific Computing
- Numerical Analysis

Dr. Xiaosheng ZHUANG (庄晓生)
*Associate Professor*
Research Interests
- Applied and Computational Harmonic Analysis
- Sparse Approximation and Directional Multiscale Representation Systems
- Compressed Sensing
- Image/Signal Processing
- Machine Learning and Pattern Recognition

Assistant Professors

Dr. Han FENG (冯寒)
*Assistant Professor*
Research Interests
- Harmonic Analysis
- Approximation Theory
- Learning Theory

Dr. Jongchon KIM
*Assistant Professor*
Research Interests
- Harmonic Analysis
- Partial Differential Equations

Dr. Wing Cheong LO (罗永昌)
*Assistant 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. Chenchen MOU (牟宸辰)
*Assistant Professor*
Research Interests
- Mean Field Games
- Stochastic Controls and Games
- Mathematical Finance
- Elliptic and Parabolic PDEs
- Stochastic Analysis

Dr. Moritz REINTJES
*Assistant Professor*
Research Interests
- Mathematical Physics
- Partial Differential Equations
- General Relativity, Fluid Dynamics and Shock Waves

Dr. Lina ZHAO (赵利娜)
*Assistant Professor*
Research Interests
- Numerical Methods for Partial Differential Equations
- Flows in (fractured) Porous Media
- Unfitted Methods for Multi-subdomain Problem
- Various aspects of Polygonal Methods (VEM, PolyDG, PolySDG)