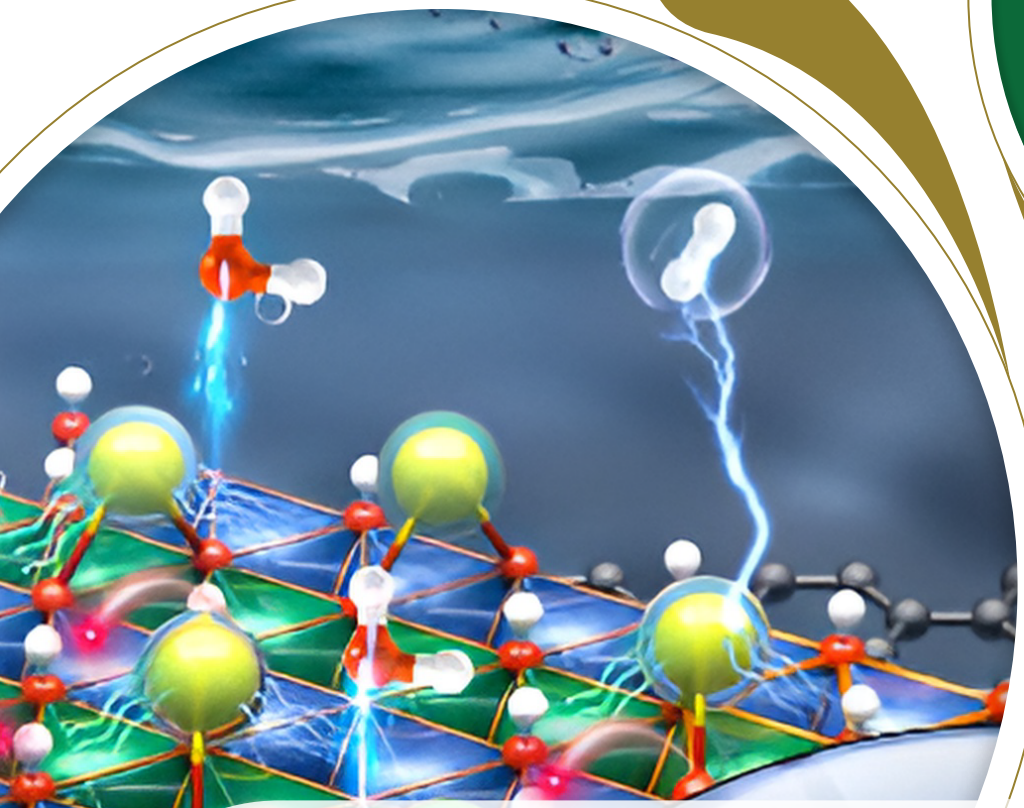
FACULTY OF SCIENCE
THE UNIVERSITY OF HONG KONG
香港大學理學院





Master of Science in the field of CHEMICAL TECHNOLOGIES for HEALTH and MATERIALS

Nurture future professionals to navigate the ever-evolving chemical industry

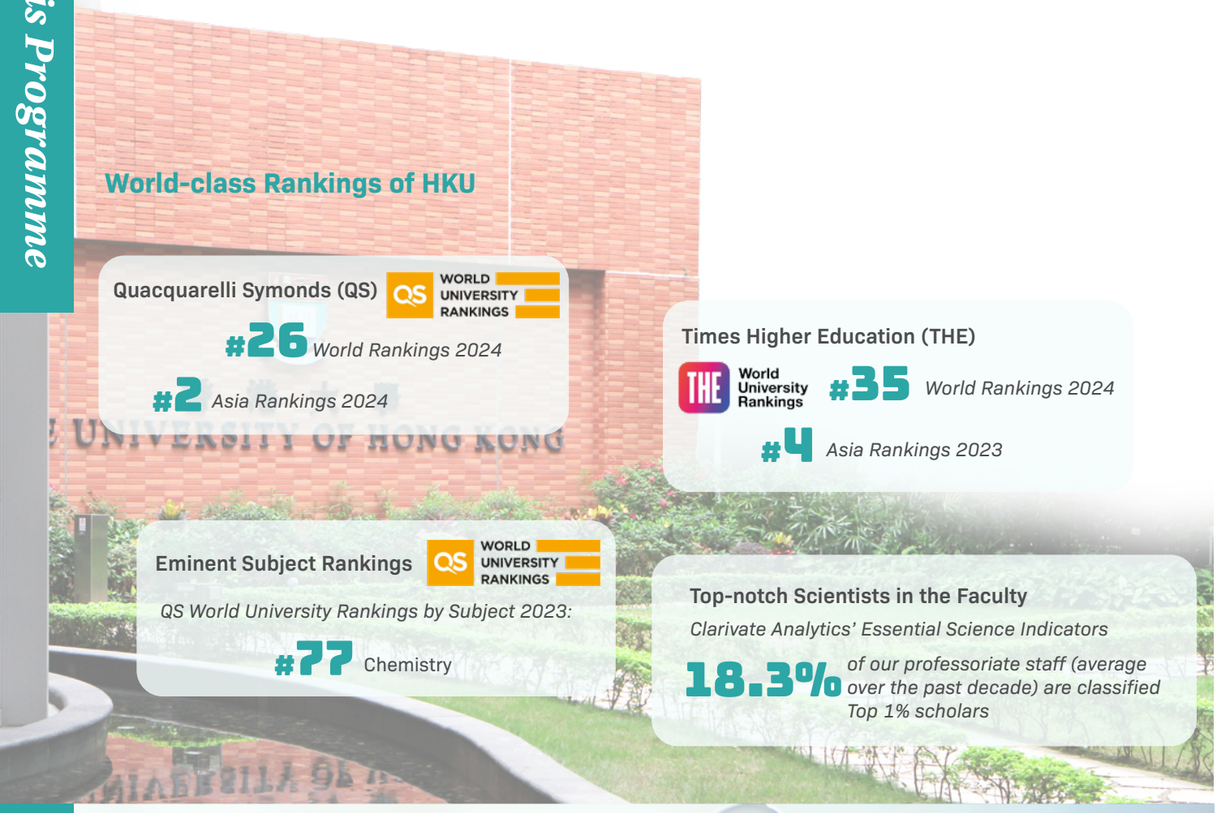
2024-25 (September 2024 intake)

SCIENCE CREATES KNOWLEDGE

IS THE PROGRAMME FOR YOU

Why this Programme

- ◊ A chemistry-empowered, innovative and comprehensive MSc programme that strengthens students' knowledge to cope with ever-evolving challenges in the health and materials industries.
- ◊ A skill-infused interdisciplinary training opportunities with extensive hands-on experience to cater for broad academic aspirations and career developments.



What the Programme Covers

- ◊ Applications of chemical technologies in health and materials are highlighted, with particular focus on drug discovery and the development of novel materials.
- ◊ The contents cover a wide range of subjects from drug design and synthesis, quality assurance, modern analysis techniques, to energy harvesting, conversion and storage, and technology transfer.
- ◊ Fostering an innovative mindset, with advanced transferable skills and ample opportunities for hands-on experience.

Programme Information

Tuition fees
Composition fee: HK$240,000# (subject to approval)
Students are required to pay Caution Money (HK$350, refundable on graduation subject to no claims being made) and Graduation Fee (HK$350). All full-time students will be charged a student activity fee of HK$100 per annum to provide support for activities of student societies and campus-wide student events.

Programme duration
Full-time: 1.5 years

Medium of instruction
English

Study load
Credits: 72 credits
Learning hours: about 1,500-2,000 hours (including 9-month project)

Class schedule
Teaching could be on weekdays or weekday evenings, with occasional concentrated teaching during weekends

Assessment
Mostly coursework and written examination

Where will this Programme Lead You

Interdisciplinary training

By integrating the practical with the theoretical knowledge, the Master of Science in the field of Chemical Technologies for Health and Materials programme acts as a conduit for interdisciplinary training and deliver the next level of operational excellence in the chemical related industries.

Career development

Talents with a strong chemistry background, laboratory skills and an innovative mindset are highly valued by many employers in social and private sectors, particular in health and energy related industries

Host

Department of Chemistry

The Department of Chemistry at HKU is a world-class institution that offers exceptional academic programmes, state-of-the-art research facilities, and a team of dedicated Faculty members who are experts in their respective fields. Some of the most distinguished chemists include Nobel Prize laureate, members of the Chinese Academy of Sciences and foreign members of National Academy of Sciences, USA. Thanks to its rigorous and cutting-edge curriculum, the Department takes pride in nurturing successful graduates who have made significant contributions in academia, industry, and government. Striving to make a profound impact on society, the Department's research outputs are nothing short of remarkable, having led to groundbreaking discoveries in fields such as drug discovery, optoelectronics, energy conversion and storage. With a commitment to providing students with the knowledge, skills, and practical experience needed to succeed in the fields of chemistry and chemistry-empowered industry, HKU Department of Chemistry is undoubtedly the top-tier institution in its field.

WHAT YOU WILL LEARN

Programme Structure

Design of curriculum (72 credits)
Core Courses (30 Credits)
CTHM7101 Advanced chemical instrumentation and data analysis *(6 Credits)* CTHM7104 Frontiers in modern materials: from theory to applications *(6 Credits)* CTHM7105 Innovation, technology transfer and entrepreneurship *(6 Credits)* CTHM7106 Bioanalytical methods: principles and diagnostic applications *(6 Credits)* CTHM8101 Research and development seminar *(6 Credits)*
Disciplinary Electives Courses (18 Credits)
CTHM7102 Synthesis for drugs and advanced materials *(6 Credits)* CTHM7103 New technologies for chemical biology *(6 Credits)* CTHM7107 Green and sustainable chemistry *(6 Credits)* CTHM7108 Quality assurance and regulatory compliance *(6 Credits)* *CTHM7109 Big data analysis in analytical science *(6 Credits)* *COMP7404 Computational intelligence and machine learning *(6 Credits)* *STAT8017 Data mining techniques *(6 Credits)* CTHM7110 Advanced materials *(6 Credits)* CTHM7111 Medicinal chemistry *(6 Credits)* **CTHM7109, COMP7404 and STAT8017 are non-permissible combination. Students are only permitted to take either one of these courses.*
Capstone Requirement (24 credits)
CTHM8102 Research project and dissertation *(24 Credits)*

Course Description

Core Courses

CTHM7101 Advanced chemical instrumentation and data analysis

The aim of this course is to provide students with an understanding of advanced modern chemical instrumentation, covering both fundamental principles and practical aspects of instrument design for qualitative and quantitative chemical analysis. The course emphasizes bridging theory and practice to address real-life problems. The frontiers in electrochemical technologies, mass spectrometry analysis and machine learning for chemical analysis will be discussed.

CTHM7104 Frontiers in modern materials: from theory to applications

This course provides an in-depth exploration of modern materials chemistry, with a focus on bridging fundamentals and practical applications. The topics include functional materials and nanodevices for energy conversion and storage, environmental issues, biomedicine, and optoelectronics. The course also covers the fundamentals of materials chemistry, design strategies, synthesis, device preparation, and characterization. Throughout the course, students will learn about the latest techniques used in materials chemistry and gain hands-on experience.

CTHM7105 Innovation, technology transfer and entrepreneurship

This course provides students exposure into how science/technology startup is conceived and established. From laboratory scientific research results to successful technology concepts and products, the students who are interested in technology transfer and entrepreneurship need to build up a spectrum of knowledge and practical experiences from technology analyses, product ideation, value evaluation, business plan, IP preparation, all the way to team building, funding raising, and go-to-market strategy. Students in this course will obtain essential understanding of how tech startup is built and triumphed, which is a key introductive step in becoming future technology transfer professionals and entrepreneurs.

CTHM7106 Bioanalytical methods: principles and diagnostic applications

This course provides an overview of bioanalytical methods for disease diagnostics and sensing applications. Course contents cover the principles and applications of modern bioanalytical techniques. Selected topics include chemistry of MRI and contrast agents, point-of-care testing, microfluidics, mass spectrometry, next-generation DNA sequencing and other nucleic-acid-based analysis, and separation science. Other emerging technologies and the latest development in bioanalytical chemistry will also be discussed.

CTHM8101 Research and development seminar

The course consists of a series of seminars, which are designed to acquaint students with the latest advancements and developments in chemical technologies that are relevant to health, well-being, materials synthesis, and analysis. The seminar series will cover topics such as the latest advancements in chemical technologies, new materials and their applications, synthesis and analysis techniques, biochemical processes involved in drug discovery and development, and other related topics. Students will present their literature research and findings in class and receive feedback from their peers and instructors.

Disciplinary Elective Courses

CTHM7102 Synthesis for drugs and advanced materials

This course provides a comprehensive training on synthetic methods that are applicable to the preparation of pharmaceuticals and organic materials. Current organic transformations, including oxidations/reductions, substitutions, enolate chemistry, and transition metal-catalyzed transformations will be covered. A focus of this course is the application of these methods in the synthesis of drugs and materials, with discussions on multiple examples in both academia studies and industrial manufacturing.

CTHM7103 New technologies for chemical biology

This course covers state-of-the-art advancements in technologies to probe chemistry in cells, with a primary focus on the latest development and application of technologies for examining cellular processes, molecular interactions, and their implications in biology and medicine. The novel technologies probing cellular chemistry using chemical biology, synthetic biology, and genome engineering methodologies, as well as techniques for single-cell analysis, microscopy, and mass spectrometry analysis, will be discussed.

CTHM7107 Green and sustainable chemistry

The principles and practices of green chemistry, focusing on renewable energy, green catalysis, and carbon neutrality will be discussed. The course covers the chemistry underlying renewable energy technologies; green catalysis in the synthesis of important chemicals, such as pharmaceuticals and polymers; and investigates the concept of carbon neutrality such as carbon capture and storage. Through a combination of lectures, readings, and case studies, students will learn about the principles and applications of green chemistry, as well as the environmental and economic benefits of this approach.

CTHM7108 Quality assurance and regulatory compliance

A good grasp of effective practices to maintain service quality and adhere to government legislations and regulatory guidelines is vital for entering into the industry. Building upon basic metrology concepts and techniques used in quality control, this course aims to provide a thorough understanding of the principles and requirements for both management and technical aspects of the international standard ISO/IEC 17025:2017, along with other management standards such as Good Laboratory Practice (GLP) and Good Manufacturing Practice (GMP). Practical guidelines for establishing, implementing and maintaining a quality management system for laboratory operation are given. Requirements of internal and external audits as stipulated in ISO/IEC 17025:2017, and criteria from accreditation bodies such as Hong Kong Accreditation Service (HKAS) and China National Laboratory Accreditation Committee (CNAS) are also addressed. Emphasis is also given to technical requirements for different disciplines.

CTHM7109 Big data analysis in analytical science

This course focuses on the application of big data analytics in analytical chemistry, health and materials sciences. It introduces students to the principles of big data analytics, current challenges, most recent development, and opportunities presented in the field. Case studies on big data analytics in chemistry, including the use of advanced analytics in the areas of drug discovery, diagnosis, materials development and environmental analysis will also be discussed.

CTHM7111 Medicinal chemistry

This course covers the chemical principles of drug design and drug action. It discuss the drug discovery, design, and development; as well as drug metabolism; prodrugs and drug delivery. It serves as an introduction to the current development of bioorganic/inorganic chemistry, pharmaceutical chemistry, and biotechnology.

Course Description

WHAT YOU WILL LEARN

Course Description

CTHM7110 Advanced materials

This course gives a comprehensive overview on materials chemistry. It focuses on the application of materials in advanced technology for renewable energy, catalytic devices, sustainable resourcification, wearable biosensors, nanoelectronics, membrane technology, and other specialty applications. The most recent development, synthesis, and characterization in materials chemistry will also be discussed.

STAT8017 Data mining techniques

With the rapid developments in computer and data storage technologies, the fundamental paradigms of classical data analysis are mature for change. Data mining techniques aim at helping people to work smarter by revealing underlying structure and relationships in large amounts of data. This course takes a practical approach to introduce the new generation of data mining techniques and show how to use them to make better decisions. Topics include data preparation, feature selection, association rules, decision trees, bagging, random forests and gradient boosting, cluster analysis, neural networks, introduction to text mining.

COMP7404 Computational intelligence and machine learning

This course will teach a broad set of principles and tools that will provide the mathematical, algorithmic and philosophical framework for tackling problems using Artificial Intelligence (AI) and Machine Learning (ML). AI and ML are highly interdisciplinary fields with impact in different applications, such as, biology, robotics, language, economics, and computer science. AI is the science and engineering of making intelligent machines, especially intelligent computer programs, while ML refers to the changes in systems that perform tasks associated with AI. Ethical issues in advanced AI and how to prevent learning algorithms from acquiring morally undesirable biases will be covered.





Capstone Requirement

CTHM8102 Research project and dissertation

The Research Project and Dissertation provides students with the opportunity to conduct original research and development project in the field of chemistry and related areas. Students will work with experienced faculty members to conduct advanced independent research projects in areas such as biomaterials, drug delivery, biocatalysis, green synthesis and analytical chemistry; which will be the basis of their thesis.

The course provides comprehensive training in design and conduct experiments, data analysis, and critical thinking. Students will learn how to design and conduct experiments, analyze experimental data, and write a high-quality research thesis. This course includes lectures, seminars, laboratory work, and independent research; which provides students with advanced knowledge of chemical regulations and safety. This course also enables students to apply scientific principles, data analysis, and other transferrable skills in real-world scenarios.

YOUR PROGRAMME EXPERTS



"What underpins our health and industry is not just about the understanding of 's-p' orbital hybridisation, but the mastery of 'Science-Practice' integration – this is what our empowering chemistry MSc programme is to offer.
A future-ready chemistry MSc programme - for learners to CREATE: Critical thinking, Resourcefulness, Excellent skills set, Active learning, Technologically savvy, and Entrepreneurially spirited."

Programme Director

Professor Zheng Xiao GUO
Chair Professor, BSc *Northeastern*; PhD *Manchester*

Programme Coordinators

Dr Kenneth King-Hei NG	MA, MSci, PhD *Cambridge*
Dr Angela Mai-Yan YUEN	BSc, PhD *HKU*

Other Academic Staff

Department of Chemistry	
Professor Chi-Ming CHE	BSc, PhD *HKU*
Professor Hongzhe SUN	BSc *Huabei*; MSc CAS *Wuhan*; PhD *London*
Professor Vivian Wing-Wah YAM	BSc, PhD *HKU*
Professor Guanhua CHEN	BSc *Fudan*; PhD *Caltech*
Professor Pauline CHIU	BSc, PhD *Toronto*
Professor Zheng Xiao GUO	BSc *Northeastern*; PhD *Manchester*
Professor Xiang David LI	BSc *Fudan*; PhD *HKU*
Professor Xiaoyu LI	BSc *Peking*; PhD *Chicago*
Professor Xuechen LI	BSc *Nankai*; MSc *Alberta*; PhD *Harvard*
Dr Ho Yu AU-YEUNG	BSc, MPhil *CUHK*; PhD *Cambridge*
Dr Aspen Xiao-Yang CHEN	BSc *Fudan*; PhD *Princeton*
Dr Ivan K CHU	BSc *Victoria*; PhD *CityUHK*
Dr Haibo JIANG	BSc *Shanghai Jiao Tong University*; PhD *Oxford*
Dr Kou OKURO	BSc *Keio*; MEng, PhD *Tokyo*
Dr Jinyao TANG	BA *USTC*; PhD *Columbia*
Dr Patrick Henry TOY	BSc *Ohio State*; PhD *Wayne State*
Dr Jian HE	BSc *Zhejiang*; PhD *Scripps*
Dr Zhongxing HUANG	BSc *Peking*; PhD *Chicago*
Dr Seungkyu LEE	BSc *SKKU*; MSc *KAIST*; PhD *UC Berkeley*
Dr Ying LI	BSc *Tsinghua*; PhD *Ilinois*
Dr Philip Yong-Xin LI	BSc *Peking*; PhD *HKUST*
Dr Junzhi LIU	BSc *Hebei*; MSc *Sichuan*; PhD *Mainz*
Dr Edmund Chun Ming TSE	BSc *Virginia*; PhD *Illinois*
Dr Yufeng WANG	BSc *Peking*; PhD *NYU*
Dr Jun YANG	BSc, MSc *Peking*; PhD *Köln*
Department of Radiology	
Dr Victor LEE	MBBS *HK*; MD *HK*; FRCR, FHKCR, FHKAM (Radiology)

Admissions

Requirements

- ◊ A Bachelor's degree in Science or Engineering
- ◊ Preference will be given to those specialising in related science or engineering disciplines (e.g. chemistry, biochemistry, material science, biotechnology, medical science, health science, analytical science, chemical engineering, environmental engineering, materials or mechanical engineering)
- ◊ Fulfil the University Entrance Requirements



How to apply

Application deadlines:
Non-local applicants: **12:00 noon (GMT +8), April 30, 2024**
Local applicants: **12:00 noon (GMT +8), June 28, 2024**

Online application:
admissions.hku.hk/tpg

Expected degree conferment will take place in

July 2026 (Summer Congregation)

Further Information

Programme details
bit.ly/mscfchem

Enquiries

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