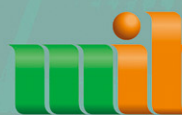香港教育大學
The Education University
of Hong Kong

Master of Arts in
Mathematics and Pedagogy
(One-year Full-time)

Department of
Mathematics and
Information Technology

Master of Arts in Mathematics and Pedagogy◄
(One-year Full-time)

Programme Aims

This programme aims to:

a) broaden students' knowledge in Mathematics;

b) help students realise how to teach Mathematics in school from an advanced mathematical standpoint;

c) expose students to different classroom environments and innovative pedagogical practices in mathematics;

d) cultivate synergy between subject knowledge and pedagogy in mathematics; and

e) foster students' critical thinking to enable them to become reflective practitioners.

Programme Structure

This programme comprises 24 credit points (cps), 3 cps for each course.
Students normally take one year (full-time) to complete the whole programme.

	Mathematical Studies (12cps)	Pedagogy in Mathematics (12 cps)
Core Courses	• Algebra and Number Theory • Foundations of Geometry • Probability and Statistics	• History and Pedagogy of Mathematics • Instructional Design in Mathematics • Technology for Mathematics Teaching: An Inquiry Approach
Elective Courses	• Calculus and Mathematical Modelling# • Combinatorics and Graph Theory#	• Artificial Intelligence in Education@ • Data Mining and STEM Education@ • Mathematical Thinking and Assessment@

(Remarks: Choose one elective course with # and one elective course with @.)

Mathematical Studies - Core Courses

• Algebra and Number Theory *(MTH6128)*

This course provides an introductory overview of basic Number theory and Modern Algebra. It provides an opportunity for students to learn algebraic structures in Mathematics and to develop students' ability to apply the strategies, techniques and theorems learned in this course to solve problems in Mathematics, and to appreciate the beauty, unity and necessity of abstraction of mathematical concepts.

• Foundations of Geometry *(MTH6129)*

This course aims to introduce various approaches to the study of mathematical ideas, properties, and relationships in geometry with specific emphasis on Euclidean geometry and its insights extended to non-Euclidean geometries.

This course will broaden the students' understanding of geometry and its implications, and provide a rigorous treatment on the foundation of Euclidean geometry. Topics in Euclidean Geometry including Euclid's Elements, congruence, geometric inequalities, parallelism, the Pythagorean Theorem are studied from an advanced standpoint. The approach to the material will be axiomatic and proofs will be required throughout. Incidence Geometry will be introduced to show how axioms affect geometric structure.

A brief treatment on non-Euclidean geometry together with the historical development of these areas will provide students with a fuller understanding of the evolution and application of mathematical concepts.

This course will equip school teachers with a sound knowledge of geometry as well as a deep understanding of its important role in problem-solving. They will gain from this course both competence and confidence to teach school geometry.

• Probability and Statistics *(MTH6130)*

This course aims at introducing students to the basics of statistics, including standard probability distributions, sampling distributions, parameter estimations, inference and statistical decision based on hypothesis testing. This course provides an introductory overview of probability and statistics. The basics of random variables are introduced. With these basics in place, concepts of sampling distributions and techniques of data analysis and hypothesis testing are then introduced and discussed.

Pedagogy in Mathematics - Core Courses

• History and Pedagogy of Mathematics *(MTH6118)*

History and Pedagogy of Mathematics (HPM) is one of the main areas of studies of the ICMI (International Commission on Mathematical Instruction). The development of mathematics and mathematics education in relation to history of mathematics will be discussed in this course. It focuses on topics such as the development of number systems, arithmetic, geometry and algebra in ancient China, as well as their influences on mathematics education.

• Instructional Design in Mathematics *(MTH6133)*

This course introduces students to the basics of mathematics teaching. Curriculum reform around the world has come to a consensus that mathematics education should prepare students to be competent mathematical problem solvers as well as critical thinkers. To this end, covering the whole syllabus and working on a variety of mathematical problems do not constitute of whole spectrum of work of a professional mathematics teacher. Coupled with sound mathematical knowledge, mathematics teachers are expected to facilitate students to develop meanings for and from their mathematical experiences. This course seeks to equip teachers with the necessary background knowledge and skills to accomplish this.

• Technology for Mathematics Teaching: An Inquiry Approach *(MTH6134)*

This course aims to introduce the use of ICT in teaching and learning school mathematics guided by an inquiry approach. Through questioning, investigation, and experimentation with mathematical concepts, students will develop knowledge and insight in the technological pedagogical content knowledge of mathematics. This course extends the learning of the course "Instructional Design in Mathematics" into the specific domain of application of ICT.

The course starts with an introduction to the socio-cultural framework of learning community and inquiry, and the pedagogical significance of using ICT in the mathematics classroom. These will be followed by introducing students to different ICT environments in mathematics education that are relevant to school mathematics; specifically, calculator, spreadsheet, dynamic geometry, graphing, dynamic statistic and web-based resources. Students will engage in using different ICT environments to explore school mathematics concepts and design teaching tasks under an inquiry and collaborative approach.

Mathematical Studies - Elective Courses *(Choose ONE from the following TWO electives)*

• Calculus and Mathematical Modelling *(MTH6131)*

We aim to let students learn practical and modelling skills, beyond elementary calculus, in solving various daily life problems that are originally raised from different dynamical situations. This course will enable students to experience the different kinds of modelling techniques to solve real life problems in various situations. Practical applications and approaches will be employed with the aids of problem solving techniques in differential equations and difference equations while optimization and numerical techniques will also be introduced.

• Combinatorics and Graph Theory *(MTH6132)*

This course aims at equipping participants with a complete picture of counting techniques and combinatorial reasoning. Topics including inclusion-exclusion principles, generating functions and recurrence relations will be introduced. Modeling with graphs and directed graph and solving real-life problems with graph algorithms are another emphasis of the course. Algorithmic complexity will also be discussed in the classes.

Pedagogy in Mathematics - Elective Courses *(Choose ONE from the following THREE electives)*

• Artificial Intelligence in Education *(INT6065)*

This course aims to equip students with the foundational and advanced knowledge of artificial intelligence coupled with an emphasis on its principles and practices in the educational setting. It also provides opportunities for students to analyse the impacts of artificial intelligence on education, and to examine its ethical and social issues. This course discusses both contemporary and emerging technologies of artificial intelligence, including but not limited to intelligent agents, problem solving, knowledge and reasoning, computer vision, robotics, natural language processing, chatbots, voice assistance, and affection detection. Frameworks for integrating education and artificial intelligence, emerging applications of artificial intelligence in education will be introduced. Ethical and social issues in artificial intelligence applications and development will be discussed.

• Mathematical Thinking and Assessment *(MTH6116)*

Mathematical thinking is an important domain for studying cognitive development in children and an essential topic of formal instruction in schools. Mathematical achievement changes markedly as children progress through school, and differences among individuals often are striking. This course is designed to enable students to understand how children gain mathematical knowledge, and to further their own mathematical development. It focuses on the models of mathematics learning and cognitive development, as well as the assessment of students' understanding and applications of mathematical concepts.

• Data Mining and STEM Education *(MTH6184)*

This course provides an overview of data mining and the fundamental concepts of STEM education. Data mining is increasingly being used to improve teaching and learning process and educational pedagogy. Teachers can use the discovered knowledge from data mining models to solve educational problems. This course covers data preprocessing, data visualization, probability and statistics for establishing the algorithms for association, classification and clustering. It also covers the concepts of STEM education for students to design STEM learning activities and discuss the social and moral issues related to STEM education. Some examples of data analytics in STEM applications are presented.

Contact Hours and Mode of Study

Classes will be scheduled between 8:30am and 9:20pm on weekdays and 8:30am to 6:20pm on Saturdays with possible scheduling of combined classes for programmes/courses of different modes of study (including full-time, part-time, mixed mode, etc.). The medium of instruction is English supplemented with Chinese. Students will have opportunities to be exposed to different language environments in learning and teaching mathematics to meet the needs in the school settings.

Entrance Requirements

The minimum requirements for this programme application
(1) A recognised Bachelor's degree, preferably in subject areas other than Mathematics; (2) Obtained in the HKALE Grade E or above in Mathematics or in HKDSE Level 4 or above in Mathematics (Compulsory Part), or an equivalent qualification in Mathematics*; and (3) Applicant whose Bachelor's degree is obtained from a non-English speaking institution should normally fulfill one of the following English proficiency requirements:

  (i)   Overall score of IELTS 6.0 (academic version); or
  (ii) Grade C or above in GCSE / GCE OL English; or
  (iii) TOEFL score of 80 (internet-based test); or
  (iv) Band 6 in the Chinese Mainland's College English Test (CET) (a total score of 430 or above and the test result should be valid within two years); or
  (v)   Other equivalent qualifications

*Applicants who had studied some Mathematics (or Mathematics-related) courses in their undergraduate or former Colleges of Education will also be considered.

Targeted Taught Postgraduate Programmes Fellowships Scheme *(For Local Students Only)*

Targeted Taught Postgraduate Programmes Fellowships Scheme is a pilot scheme to provide fellowships for local students pursuing designated taught postgraduate programmes in the eight University Grants Committee (UGC)-funded universities. Successful applicants will only need to pay the tuition fee of HK$42,100.

For more details, please visit http://www.eduhk.hk/mamp/ or send email to mamp@eduhk.hk.

Tuition Fee

This programme is offered on a self-financed basis. The tuition fee is HK$126,000 for the whole programme, which is provisional and subject to adjustment. Tuition fees paid are normally not refundable nor transferable.

Programme Information & Application
https://www.eduhk.hk/mit/en/mamp

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