Introduction to Mathematics Major and Minor Apr 2018

Minor in Computational & Financial Mathematics

and

Minor in Operations Research & Mathematical Programming

Department of Mathematics

Dr. C.W. WONG

GREATER BAY AREA

The Greater Bay Area plan is an economic development plan to integrate Hong Kong, Macau and 9 cities of Guangdong into a world class city cluster; aiming to drive economic growth and strengthen transportation.

What would be the role of Hong Kong?

* Innovative World Financial Center
* Regional Logistics Hub

In order to achieve these goals, Hong Kong needs to attract more innovation resources and promote joint research, so as to serve as an international science and innovation center.

Minor in Computational and Financial Mathematics

Quants: The Rocket Scientists Of Wall Street

As financial securities become increasingly complex, demand has grown steadily for people who not only understand the complex mathematical models that price these securities, but who are able enhance them to generate profits and reduce risk. These individuals are known as quantitative analysts, or simply "quants."

Due to the challenging nature of the work – a blend of mathematics, finance and computer skills – quants are in great demand and able to command very high salaries.

http://www.forbes.com/sites/investopedia/2013/06/07/quants-the-rocket-scientists-of-wall-street/

Recruitments (2017)

Renaissance Technologies LLC is an investment management company dedicated to producing superior returns for its clients and employees by adhering to mathematical and statistical methods.

Research Scientist

Use machine-learning, applied mathematics, and techniques from modern statistics to develop and refine models of the financial markets and to develop trading algorithms based on those models.

An ideal candidate will have

* a degree in computer science, mathematics, physics, statistics, or a related discipline
* a demonstrated capacity to do first-class research
* strong computer programming skills

Experience in finance is not required.

https://www.rentec.com/Careers.action?researchScientist=true

Objective

Minor in Computational & Financial Mathematics

The Minor in Computational & Financial Mathematics provides students with fundamental knowledge in both computational mathematics and financial mathematics. It is specifically designed for students who are interested in the above subjects and those whose majors require sophisticated mathematical skills. It aims to nurture quantitative reasoning, logical, analytical and critical thinking, innovative imagination, meticulous care to work, ability to conceptualize, skills for problem-solving and skills to tackle novel situations and ill-defined problems. It is particularly useful for solving mathematical problems arising from computational sciences and financial industry.

Minor in Computational & Financial Mathematics

		Minor in Comp. Fin.	BSc (ActuSci)	B Engg	BSc (DA/Qfin/RM/Stat)
Year 1	Sem 1	MATH1013	MATH1821	MATH1851 MATH1853	MATH1013 MATH2014
	Sem 2	List A MATH2101 MATH2211 List B MATH2012 MATH2014	MATH2822		
Year 2 (Intro Level) 18 credits			*Take 6 credits from MATH2102, MATH2241, or any 6-credit level 2 or above Disciplinary Electives of this Minor to replace MATH1013. Take another 6 credits from above to replace MATH2014 if necessary	*Take 6 credits from MATH2102, MATH2241, or any 6-credit adv. level Disciplinary Electives of this Minor to replace MATH1013	*Take 6 credits from MATH2102, MATH2241, or any 6-credit level 2 or above Disciplinary Electives of this Minor to replace MATH1013. Take another 6 credits from above to replace MATH2014 if necessary
Year 3 Year 4 (Adv. Level) 24 credits		MATH3601(NA) MATH3906(FC) *ANY TWO OF* MATH3408(CMDE) MATH3603(PT) MATH3904(IO) MATH3911(GT) MATH4602(SC) MATH4907(NMFC) MATH7217(TFM) MATH7224(TAPT)			

1. Students must have level 2 or above in HKDSE Extended Module 1 or 2 of Mathematics or equivalent to take this minor. Students who do not fulfill this requirement are advised to take MATH1011 *University Mathematics I*.
2. Double-counting of courses up to a maximum of 24 credits is permissible ONLY when a student with a science major opts to undertake a second major in science. The proposed replacement (*) is not finalized yet.

Minor in Operations Research & Mathematical Programming

Operations Research and Logistics

Logistics problems are ill structured and real- world problems.

* Network optimization and queueing theory are used to predict the waiting time of the trucks for loading/unloading purposes.
* Selection of transport route which minimizes the time and cost of transportation.

Objective

Minor in Operations Research & Mathematical Programming

The Minor in Operations Research & Mathematical Programming provides students with fundamental knowledge in optimization, computational algorithm, mathematical modeling, and decision making. It is specifically designed for students who are interested in the above subjects and those whose majors require sophisticated mathematical skills. It aims to nurture quantitative reasoning, logical, analytical and critical thinking, innovative imagination, meticulous care to work, ability to conceptualize, skills for problem-solving and skills to tackle novel situations and ill-defined problems. It is particularly useful for solving mathematical problems arising from decision sciences and logistic industry.

Minor in Operations Research & Mathematical Programming

		Minor in Comp. Fin.	BSc (ActuSci)	B Engg	BSc (DA/Qfin/RM/Stat)
Year 1	Sem 1	MATH1013	MATH1821	MATH1851 MATH1853	MATH1013 MATH2014
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Year 3 Year 4 (Adv. Level) 24 credits		MATH3901(ORI) MATH3904(IO) *ANY TWO OF* MATH3405(DE) MATH3600(DM) MATH3905(QT) MATH3096(FC) MATH3911(GT) MATH3943(NM) MATH4902(ORII) MATH4907(NMFC) MATH7502(TADM) MATH7503(TMPO)			

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The place where Finance meets Operations Research

Expanding markets and the increasing complexity and variety of financial products have generated a **growing demand for skilled professionals to create, price and hedge complex derivatives**. The specialization in Financial Engineering provides you with advanced qualifications in operations research and finance, from the management of financial portfolios to risk analysis in financial markets. Financial Engineering is the place where finance meets operations research!

Financial Engineering uses techniques from operations research such as simulation and simulation-based optimization for evaluating options or portfolio optimization. Financial analysts find work at major banks, brokers, and institutional investors such as insurance companies.

http://masters.vu.nl/en/programmes/econometrics-operations-research-financial-engineering/index.aspx

Mathematics and AI

The aim of the conference CPAIOR is to bring together interested researchers from Constraint Programming (CP), Artificial Intelligence (AI), and Operations Research (OR) to present new techniques or applications, and to provide an opportunity for researchers in one area to learn about techniques in the others.

A main objective of this conference series is also to give these researchers the opportunity to show how the integration of techniques from different fields can lead to interesting results on large and complex problems.

Mathematics and AI

Some courses may equip you for entering the study of AI

* MATH2014 – Multivariable Calculus and Linear Algebra
* MATH2101 – Linear Algebra I
* MATH2102 – Linear Algebra II
* MATH2211 – Multivariable Calculus
* MATH3600 – Discrete Mathematics
* MATH3603 – Probability Theory
* MATH3901 – Operations Research I
* MATH3904 – Introduction to Optimization
* MATH3911 – Game Theory and Strategy
* MATH4902 – Operations Research II

Needs

* **Modeling skills (both mathematical and statistical)**
  * Mathematical Modeling, Statistical Modeling, … etc.
* **Computational skills**
  * C++ and alike.
* **Some knowledge in finance and economics**
* **Mathematical Skills**
  * Financial Calculus, Numerical Analysis, Operations Research, Optimization, Simulation etc.
* **Brainy Enough**
  * Develop a logical mind with sharp observations – very close to doing research in pure math postgraduate studies.

LEARN THE MOST DIFFICULT ONES IN 4 YEARS, AND PICK UP THE REST ALONG YOUR CAREER!

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Thank You