

GF04 (Mathematics and Statistics of Algorithmic Trading)

<i>Year:</i>	2017–2018
<i>Code:</i>	MATHGF04
<i>Value:</i>	15 UCL credits (= 7.5 ECTS)
<i>Term:</i>	2
<i>Structure:</i>	3 hour lectures per week
<i>Assessment:</i>	100% examination. Student must achieve at least 50% to pass this course.
<i>Normal Pre-requisites:</i>	MATHGM21 Quantitative & Computational Finance
<i>Lecturer:</i>	Dr H Ni

Course Description and Objectives

The objective of this course is to introduce mathematical concepts and tools used in the finance industry for algorithmic and high-frequency trading.

Some of the techniques taught in this course are standard in the finance industry and other material is cutting edge research that is currently being applied by proprietary trading desks. The student will be familiar with industry-standard methods and will be able to set-up and solve stochastic control problems that deal with the most up-to-date requirements of the industry; market making, optimal liquidation, optimal execution, VWAP schedules, statistical arbitrage and pairs trading.

On successful completion of the course, a student should have a good understanding of how electronic markets function and what are the problems faced by stakeholders when buying and selling assets. Students will have a good understanding of market making activities - designated traders, specialists, and high-frequency traders. Moreover, the student will be familiar with some of the classical microstructure theory of market making and will be able to work with ultra-high frequency data (millisecond stamped).

Recommended Texts

Álvaro Cartea, Sebastian Jaimungal & Jose Penalva, *Algorithmic and High-Frequency Trading*, Cambridge University Press, 2015.

Detailed Syllabus

- Electronic markets and the limit order book
- A primer on the microstructure of financial markets
- Optimal execution
- Optimal execution with limit and market orders
- Targeting volume
- Market making
- Pairs trading and statistical arbitrage strategies
- Order imbalance