UNIVERSITY OF JOHANNESBURG

SOE
SCHOOL OF ECONOMICS

MASTER OF FINANCIAL ENGINEERING
School of Economics | 2023

The Future Reimagined

MASTER OF FINANCIAL ENGINEERING
School of Economics | 2023

A NEW qualification was introduced by the School of Economics in 2022, replacing the MCom in Financial Economics -

What is the Master of Financial Engineering?

Financial engineering is a cross-disciplinary field combining financial and economic theory with the mathematical and computational tools needed to design and develop financial products, portfolios, markets and regulations.

Financial engineers manage financial risks, identify market opportunities, design and value financial or actuarial products and optimise investment strategies. Sophisticated modelling and information technology now dominate the financial world.

The theories and the practice of Finance are challenged today by complex financial and global systems and by dynamically changing regulatory environments and politics. A global world in transition creates both opportunities and challenges for financial engineers to adapt theoretical and financial constructs into profitable and innovative opportunities by creating mission requirements, innovative, custom-designed instruments in the marketplace.

At the School of Economics, we train our students to do exactly that: to engineer the future of finance and transform financial theory into practice. The Master of Financial Engineering program is part of a suite of qualifications for students who want to gain the breadth and depth of technical skills and knowledge across the key disciplines of finance and economics, mathematics and statistics and computer science and software engineering.

Purpose of the Master of Financial Engineering

The Master of Financial Engineering program provides financial education at the forefront of both academic thinking and industry practice. Using tools from finance and economics, engineering, applied mathematics and statistics, the Master of Financial Engineering addresses problems unique to certain industries including: investment and commercial banks, trading companies, hedge funds, insurance companies, corporate risk managers, and regulatory agencies. Such problems include derivative securities valuation, strategic planning and dynamic investment strategies and risk management.

In order to be considered for selection for the NEW Master of Financial Engineering, qualification an applicant is required to comply with the programme's minimum admission criteria, participate in a two week pre-selection entrance course and write the exam.

Admission Requirements:

Students wanting to apply for the Master in Financial Engineering must adhere to all the following:

- A potential student must be in possession of an Honours qualification, or an equivalent four-year qualification, (excluding BTech) with a minimum level of competency on NQF Level 8;
- A potential student must have obtained a 65% average for the NQF level 8 qualification.
- If conditionally selected for the program, the student must attend and pass the preselection entrance course (the pass mark is determined by the head of the program);
- The preselection entrance course is run over two weeks;
- Mathematics and Statistics skills will be tested;
- High quantitative skills are needed;
- An examination will be written;
- Only successful candidates will be accepted into the Master of Financial Engineering course; and
- There is limited place available.

The NEW Master of Financial Engineering qualification will be replacing the current MCom (Financial Economics) programme, which will not be accepting new applications from 2022, the current cohort will be allowed to complete the programme.

About the School of Economics:

The School of Economics core activity is to train economists in various fields of economics (financial economics, industrial policy, development economics, local government economics, econometrics, competition & regulation economics, environmental economics and trade economics).

The School of Economics is ranked 4th in Economics and Econometrics in Africa.

The Department consists of six distinct clusters namely:

- The economic development cluster;
- The industrial policy cluster (which includes the Institute for Economic Development and Planning (IDEP) program);
- The financial economics cluster (includes a partnership with University of Ohio);
- The local economic development cluster (includes CENLED);
- The environment economics and public sector cluster (PEERC);
- The cluster for competition & economic regulation (CCRED); and

The School of Economics is one of six Schools that make up the College of Business and Economics, in short CBE, at the University of Johannesburg. The CBE strives to develop critical thinkers and problem solvers that address business, economic and societal challengers.

Composition of the Master of Financial Engineering Degree:

MODULES:

The Master of Financial Engineering degree consists of:

1. 11 modules,
2. A minor dissertation covering an approved topic in a specialisation area; and
3. The research component of the degree comprises 50% of the final mark, which is in line with the latest Higher Education Qualifications Sub- Framework (HEQSF) requirements.

The Master of Financial Engineering degree is compiled of the following modules:

Year 1: Semester 1 Module	Year 1: Semester 2 Module
Applied Econometrics and Machine Learning	Behavioural Finance
Cyber Security	Block Chain
Introduction to Coding	Debt Market Modelling
Portfolio Optimization and Risk Allocation	International Finance
Stochastic Processes in Financial Economics	Macroeconomics and Business Fluctuations
Year 2: Semester 1 Module	**Year 2: Semester 2 Module**
Research Design	Minor Dissertation

In addition to the above modules, each student is required to write a minor dissertation on an approved topic. The ability to conduct independent (although guided) research within a study field is an essential indicator of mastery within that particular field.

Working closely with your appointed supervisor, you will be expected to produce a Minor Dissertation on an approved topic in financial engineering. To be accepted, your research should be based on a specific and well-articulated hypothesis (or research question) and must include details of an established econometric methodology used to test this hypothesis.

Overview of the Master of Financial Engineering Curriculum Modules:

APPLIED ECONOMETRICS AND MACHINE LEARNING:

The purpose of this module is to provide students with a foundation to pursue applied research projects involving financial time series and big data. The module introduces the concepts of probability theory, and mathematical statistics and machine learning; and develops methods for estimation and inference of univariate and multivariate time series and other big data models

PORTFOLIO OPTIMISATION AND RISK ALLOCATION:

The purpose of this module is to equip students in the area of risk allocation using robust optimisation techniques. Optimisation covered in this module consists of dynamic optimisation, multi-objective optimisation and online portfolio optimisation using machine learning techniques. Optimisation is applied with particular emphasis on market, credit, operational and liquidity risks within the context of Financial Economics.

DEBT MARKET MODELLING:

The purpose of this module is to familiarise students with the theory of debt markets and term structure of interest rates. The module will also focus on the valuation of debt instruments, price sensitivity and the valuation of fixed income assets. Moreover, the module equips students to understand the current regulatory environment of the debt market.

STOCHASTIC PROCESSES IN FINANCIAL Engineering:

The purpose of this module is to develop the student's understanding of the fundamentals of advanced concepts related to financial phenomena unfolding dynamically and unpredictably over time. These include the diffusion processes, Brownian motion, risk theory (aggregate claims, insurance risk, and ruin probability) and options pricing using stochastic differential equations within the context of Financial Economics. The module also focuses on the advanced understanding of modern financial instruments such as futures, forwards, options and swaps and their implication on risk allocation and portfolio modelling using discrete and continuous time model.

MACROECONOMICS AND BUSINESS FLUCTUATIONS:

The purpose of this module is to acquaint students with both basic and advanced concepts of Macroeconomics. The module focuses on the analysis of economic growth in the long run and in so doing it complements the analysis of short-run business fluctuations. The module considers various models of economic growth starting from the neoclassical theories to the more recent innovation-based models.

BEHAVIOURAL FINANCE:

The purpose of this module is to provide students with an alternative perspective to traditional finance theory which is based on the rational expectations model. Drawing on insights from financial psychology, this module explores the impact of psychological heuristics and biases on investor behaviour. Furthermore, the module draws on psychological heuristics to model uncertainties using rank dependence and prospect.

INTERNATIONAL FINANCE:

The purpose of this module is to provide students with both the theory and application of international finance with respect to cross- country trade. The module focuses mainly on issues related to the effects of trade barriers on domestic production, prices, consumption, balance of payments, foreign

exchange market, currency arbitrage, interest rate arbitrage, carry trades and balance of payment determination models.

INTRODUCTION TO CODING:

The purpose of this module is to provide students with a foundation to use programming to solve basic computational problems typical in the field of financial engineering. The module introduces the concepts of data, different variables, object-orientated programming and error handling. This module forms an important foundation for postgraduate study in financial engineering.

CYBERSECURITY:

The primary purpose of this module is to provide students with a broad understanding of cyber security, Digital Forensics, and Cryptography concepts. In addition, the module introduces the mechanisms that are used in implementing different cybersecurity services such as encryption and hash codes; regulatory measures such as the US National Institute of Standards and Technology (NIST) Framework and International Organisation for Standardisation (ISO) 27000; as well as the analysis and recommendations for security improvements.

BLOCLCHAIN

The purpose of this module is to provide students with an understanding of the blockchain technology in terms of the underlying principles of operation, methodology and the computer networking foundations. The role and impact of blockchain in the financial domain is discussed to evaluate cryptographic currencies as a universal means of exchange

Course, Presentation and Assessment:

Generally, lectures take place on Tuesday, Wednesday and Thursday evenings from 18:00 to 21:00. Occasionally, lectures will also be scheduled to take place at the same times on other week nights. The normal venue for the Master of Financial Engineering lectures will be communicated to you in due course.

Course Duration

The Master of Financial Engineering degree must be completed in a minimum of 2 or a maximum of 3 years. Course work is completed in year 1. Students must complete their dissertation in year 2. Extensions of study after 3 years must be approved by the Executive Dean of the College of Business and Economics.

Pass Requirements:

The required pass mark is 50%.

The 50% rule applies to the minor dissertation as well - the contribution of the mini dissertation to the final mark is 50%. The other modules pass marks combined is 50%. Candidates pass with a distinction if they achieve a final aggregate mark of 75% and 65% in all individual modules.

Students who fail three modules or more during the first year of study will not be allowed to continue with their studies. A module that is failed more than twice will lead to an academic exclusion.

Language medium and computer literacy:

The medium of instruction is in English.

Classes and the study material are presented in English. Class discussions and student participation will take place in English. Students must be computer literate and have access to e-mail and the internet.

Commencement of Classes:

Lectures commence in February. Class attendance is compulsory. No applications can be considered after the commencement of classes. If students are unable to attend a class they must deregister the module and complete it the following year.

Course Fees:

Information regarding course fees for the Master of Financial Engineering and a list of bursaries and scholarships is available on the UJ website: https://www.uj.ac.za/studyatUJ/Student- Finance

How to apply:

Applications to the University Johannesburg can be submitted either online or by submission of a hard copy application. The applicant submitting an application online is exempted from paying an application fee and a hard copy application needs to be accompanied by a proof of payment of the amount of +-R250 (subject to change).

All applications must be accompanied by CERTIFIED copies of the following:

- Degree certificates (BCom Honours or relevant, equivalent four-year university degree);
- Official academic record;
- Certificate of conduct (obtained from the University where the BCom Honours or relevant, equivalent four year degree was completed);
- ID or Passport (certified); and
- A recent abridged CV.

International applications to the University of Johannesburg need to be accompanied by the certified copies of the following documents:

- Passport or National Identity Document;
- Academic Transcript from the previous institution/s;
- Degree certificate/s; and
- Evaluation certificate from SAQA or the equivalency can be done at the University through the UK-Naric system.

The last day for the submission for international applications for study in the 2023 academic year is 30 September 2022 at mid-day (preferably apply sooner). International applications may apply online by clicking on the following link; APPLY HERE should you encounter difficulties when attempting to submit your application online, kindly send an e-mail to tshepangm@uj.ac.za

SAQA contact details:

South African Qualifications Authority (SAQA)

Centre for the Evaluation of Educational Qualifications (CEEQ)

Postnet Suite 248

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Waterkloof

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Telephone: +27 12 431-5070

Fax no: +27 12 482-5147

Email: saqainfo@saqa.org.za

Website: www.saqa.org.za

Opportunities for further studies:

It is possible for candidates who obtain acceptable marks and who wish to study further to apply for a PhD degree in Economics or Finance:

Post Graduate Centre (PGC:

The PGC consists of three functional areas, namely:

Funding Support, Information Services and Research Capacity Development.

Other services provided by the Postgraduate School:

- Workshops (e.g. Master's Dissertation, Research Writing, Academic Writing Skills);
- Training sessions (in collaboration with the Library and ADS);
- Postgraduate symposia;
- Social and networking functions;
- Working space for postgraduate students, supported by 20 computers and a quiet atmosphere; and
- Seminars and conferences on higher education development.

For more information, please contact: https:// www.uj.ac.za/postgraduate-school

How to contact us:

For more information you can contact:

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