### COURSE DETAILS

<table>
<thead>
<tr>
<th>Course Code:</th>
<th>F71AJ</th>
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<tbody>
<tr>
<td>Full Course Title:</td>
<td>Financial Economics 2</td>
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<tr>
<td>SCQF Level:</td>
<td>11</td>
</tr>
<tr>
<td>SCAF Credits:</td>
<td>15</td>
</tr>
<tr>
<td>Available as Elective:</td>
<td>No</td>
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</tbody>
</table>

### DELIVERY LEVEL

<table>
<thead>
<tr>
<th>Undergraduate:</th>
<th>Yes</th>
<th>Postgraduate Taught:</th>
<th>Yes</th>
<th>Postgraduate Research:</th>
<th>No</th>
</tr>
</thead>
</table>

### COURSE AIMS

This course aims to provide a good understanding of the concepts, methods and mathematics used in arbitrage pricing in discrete and continuous time.

### LEARNING OUTCOMES – SUBJECT MASTERY

Students should be able to:

- demonstrate an understanding of the main aspects of martingale theory in discrete and continuous time.
- know the main results and basic applications of stochastic Ito calculus in problems of financial mathematics.
- understand the role of equivalent martingale measures in the arbitrage-free pricing of contingent claims and their connection with arbitrage free/complete markets.
- understand the martingale representation theorem and its role in financial applications.
- understand stochastic differential equations.
- state the binomial and Black Scholes model.
- derive the Black-Scholes formula and the Black-Scholes partial differential equation.
- price simple contingent claims (in particular, European-style options and forward contracts).
- understand the concepts of replication and hedging.
- construct a buy-and-hold portfolio for a simple contingent claim.
- construct a portfolio that is neutral with respect to the delta and gamma, and understand the implications of the neutrality.
- simple extensions of the Black-Scholes model, for example to dividend-paying stocks, and the corresponding Black-Scholes formula.
- know desirable characteristics of term structure models.
- know well-known short rate models and their advantages and disadvantages.
- derive relationships between forward interest rates, spot rates and zero-coupon bond prices.
- manipulate explicit zero-coupon bond price formulae for the Vasicek and Cox-Ingersoll-Ross models, and derive the implied forward rate curves.
- understand basic credit risk models and define the different approaches to the modelling of credit risk.
- know stochastic models for stock prices other than the Black-Scholes model.
LEARNING OUTCOMES – PERSONAL ABILITIES

On completion of this course the student should be able to:

- Demonstrate knowledge and critical understanding of the concepts and models in financial mathematics.
- Demonstrate the ability to learn independently.
- Manage time, work to deadlines and prioritize workloads.
- Present results in a way that demonstrates that they have understood the technical and broader issues in financial mathematics.

SYLLABUS

- Background on financial derivatives.
- The binomial model of stock prices.
- Definition and properties of Brownian motion and stochastic integrals.
- Stochastic differential equations.
- Geometric Brownian motion and Ornstein-Uhlenbeck process.
- Definition and examples of continuous-time martingales, including the stochastic integral as a martingale.
- Statement of the Martingale Representation Theorem.
- Stochastic calculus and Ito’s Formula.
- Change of measure and Girsanov’s Theorem.
- The Black-Scholes Model.
- Other models of stock prices.
- Portfolio risk management.
- Models of the term structure of interest rates.

Introduction to credit risk models.

LOCATION AND ASSESSMENT METHODS

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Level</th>
<th>Title</th>
<th>School</th>
<th>Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>F71AH</td>
<td>11</td>
<td>Financial Economics 1</td>
<td>School of Math and Comp Sci.</td>
<td>Linked</td>
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</tbody>
</table>

Examination will be at least 60% and no more than 80%.

Coursework will be at least 20% and no more than 40%.
Re-assessment in the next academic year.