

# Course Descriptions Master 2020-2021

Course Title Mathematical Finance  
 Course Code EBC4121  
 ECTS Credits 6,5  
 Assessment Whole/Half Grades

| Period | Start    | End       | Mon | Tue | Wed | Thu | Fri |
|--------|----------|-----------|-----|-----|-----|-----|-----|
| 4      | 1-2-2021 | 26-3-2021 |     | X   |     |     | X   |

Level Advanced

Coordinator Antoon Pelsser For more information: [a.pelsser@maastrichtuniversity.nl](mailto:a.pelsser@maastrichtuniversity.nl)

Language of instruction English

Goals The principal aim of this course is to provide students with an appreciation and understanding of how the application of mathematics, particularly stochastic mathematics, to the field of finance may be used to illuminate this field and model its randomness, resulting in greater understanding and quantification of investment returns and security prices.

Description PLEASE NOTE THAT THE INFORMATION ABOUT THE TEACHING AND ASSESSMENT METHOD(S) USED IN THIS COURSE IS WITH RESERVATION. THE INFORMATION PROVIDED HERE IS BASED ON THE COURSE SETUP PRIOR TO THE CORONAVIRUS CRISIS. AS A CONSEQUENCE OF THE CRISIS, COURSE COORDINATORS MAY BE FORCED TO CHANGE THE TEACHING AND ASSESSMENT METHODS USED. THE MOST UP-TO-DATE INFORMATION ABOUT THE TEACHING/ASSESSMENT METHOD(S) WILL BE AVAILABLE IN THE COURSE SYLLABUS. The aim of the course is to provide students with an appreciation and understanding of the main ideas and concepts of mathematical finance. The core of mathematical finance concerns questions of pricing and hedging of financial derivatives such as options whose value depend on that of an underlying risky asset. We will discuss the general principles of continuous-time financial markets where the investor can buy and sell  $d+1$  assets. As a special case we will consider the Black-Scholes model for a financial market. We will further point out the link between the no-arbitrage condition and certain probability measures, the so called equivalent martingale measures. In complete markets as well as in incomplete markets these measures allow to price financial derivatives in an arbitrage-free way. Moreover, we will consider probabilistic models for bond markets and apply the theory of equivalent martingale measures to the pricing of fixed income securities. Finally, we will address the issue of estimating the parameters of the probabilistic models from historical data.

Literature Bingham, N.H., Kiesel, R. (2004). Risk-Neutral Valuation: Pricing and Hedging of Financial Derivatives, 2nd edition, Springer, London Berlin Heidelberg.

Prerequisites Students should have knowledge of stochastic processes, in particular Brownian motion, geometric Brownian motion and the underlying stochastic differential equations. Moreover, students should be familiar with the Ito integral and the Ito formula. Knowledge of the Girsanov transformation is helpful, but not required.

Teaching methods PBL / Presentation / Lecture / Assignment

Assessment methods Participation / Written Exam

Evaluation in previous academic year For the complete evaluation of this course please click <http://iwio-sbe.maastrichtuniversity.nl/rapporten.asp?referrer=codeUM>

This course belongs to the following programme / specialisation

|   |                         |
|---|-------------------------|
| Master Econometrics and Operations Research | Elective Course(s)      |
| SBE Exchange Master                         | Master Exchange Courses |
| SBE Non Degree Courses                      | Master Courses          |