COURSE SPECIFICATION FORM

for new course proposals and course amendments

Department/School:	**Mathematics**	**Academic Session:**	**2017-18**
Course Title:	Mathematics of Financial Markets	**Course Value:** (UG courses = unit value, PG courses = notional learning hours)	0.5 unit
Course Code:	MT3470	**Course JACS Code:** (Please contact Data Management for advice)	G100
Availability: (Please state which teaching terms)	Term 1	**Status:**	Optional Condonable
Pre-requisites:	MT1300 and MT1720 Or MT1720 and MT2320	**Co-requisites:**	-
Co-ordinator:	-		
Course Staff:	-		
Aims:	This course aims to show how mathematics and statistics are used (and sometimes misused) by those who work in securities markets. Since many of our graduates find employment in this area, the topics in the course are chosen to demonstrate the most important applications. They are portfolio theory, two simple asset pricing models, the general behaviour of markets (how random, how chaotic are they?) and the theory of derivative securities.		
Learning Outcomes:	On completion of the course the student should be able to: • understand the ideas of risk and return and how they can be measured; • formulate Markowitz portfolio theory as an optimization problem and use simple algorithms to solve it; • understand the assumptions behind asset pricing models and the mathematical arguments leading to them; • appreciate the consequences of a random walk model of price change and the arguments for and against such a model; • understand the Black and Scholes formulation of option pricing and find simple solutions of the equation.		
Course Content:	Portfolio analysis: Risk and return. Mean-variance portfolio theory, the efficient frontier. Lending and borrowing: finding the market portfolio. Utility theory. Correlation models: single-index and multi-index. Pricing models: Capital asset pricing model, arbitrage pricing model. Looking for opportunities. Market movements: The random walk model and its shortcomings. The efficient market hypothesis. Skewness and kurtosis. Brief discussion of ideas from chaos theory. Futures and options: Introduction to derivatives. Pricing of futures. Options: payoff at expiry, use in hedging positions. Put-call parity and related inequalities. Pricing by binomial trees. Brief discussion of Wiener and Ito processes. Delta-hedging and the Black-Scholes equation. Reduction to a diffusion equation and solution for a European call. The American put problem.		
Teaching & Learning Methods:	33 hours of lectures and examples classes. 117 hours of private study, including work on problem sheets and examination preparation. This may include discussions with the course leader if the student wishes.		
Key Bibliography:	Paul Wilmott Introduces Quantitative Finance – P Wilmott (Wiley 2007) Library Ref. 332.632 WIL Modern Portfolio Theory and Investment Analysis − E J Elton and M J Gruber (Wiley 2003). Library Ref. 332.6 ELT The Mathematics of Financial Derivatives − P Wilmott, S Howison and J Dewynne (Cambridge 1995). Library Ref. 332.632 WIL		
Formative Assessment & Feedback:	Formative assignments in the form of 8 problem sheets. The students will receive feedback as written comments on their attempts.		
Summative Assessment:	**Exam:** A two hour written paper. 100% **Coursework:** None		

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