CURSO DE FÉRIAS INTERNACIONAL UFJF – JULHO/2017 *INTERNATIONAL WINTER PROGRAMMES*				
FACULDADE ***School***	**CURSO** ***Course***	**PROFESSOR**	**CARGA HORÁRIA** ***Hours Class***	**IDIOMAS** ***Instruction Languages***
Graduate Program of Economics (PPGE/UFJF)	**Theoretical and computational aspects of the Black-Scholes equation**	Paulo C. Coimbra, Ph.D. (UFJF)	12 hours	English

DESCRIÇÃO DO CURSO *COURSE DESCRIPTION*		
Theoretical and computational aspects of the Black-Scholes equation	When	July, 25th, 26th and 27th, from 02:00 P.M. to 06:00 P.M.
	Where	Sciences Center, Auditorium 1.
	Brief description	**Aims:** This course meets the expectations of the *Graduate Program in Economics* at *Federal University of Juiz de Fora* (*PPGE/UFJF*), in order to attract foreign students to its M.Sc.'s and/or Ph.D.'s Programs in Economics, as well as to allow a greater integration with students from courses of the areas of social sciences and exact sciences. The course has the purpose to discuss about theoretical and computational aspects of the Black-Scholes equation (see the program below) and is in line with the *Asset Pricing* course offered at PPGE/UFJF, which in turn is part of *applied finance*, in the area of action within the PPGE's research line of *applied microeconomics*. It will also serve to attract to the PPGE students of other areas of social sciences, such as business administration and accounting sciences as well as students from the exact sciences, among which we could highlight: mathematics, statistics, physics, computer science and engineering. **Program:** 1. A brief introduction to stochastics process: from Brownian motion to Itô's lemma; 2. The Black-Scholes partial differential equation; 3. A closed-form solution to the Black-Scholes partial differential equation, through the heat equation: the Black-Scholes formulae; 4. Extensions of the Black-Scholes formulae; 5. Hedging portfolios: the Greeks; 6. Computational implementations in Python and in an Android app to calculate option prices (based in the Black-Scholes type formulas) and the Greeks (to hedging purposes); 7. A brief discussion on the limitations of the Black-Scholes formula (such as volatility smile among others) and further extensions to more precise models to predict option pricing.

References:

COIMBRA, Paulo C. (2017) "*Theoretical and computational aspects of the Black-Scholes equation*". monograph, Specialization on System Developing with the use of Java's Technologies at the Computer Science Department of the Federal University of Juiz de Fora.

HULL, John (2017) "*Options, Futures and other Derivative Securities*", 10th edition. Pearson.

PAPANICOLAOU, Andrew (2017) "*Introduction to Stochastic Differential Equations (SDE's) for Finance*". mimeo, Department of Finance and Risk Engineering - Tandon School of Engineering, New York University.

Brief vitae of Paulo C. Coimbra, Ph.D.:

I received Ph.D. and M.Sc.'s degree in Economics from *Graduate School of Economics at Getulio Vargas Foundation (EPGE/FGV-RJ)* and a B.A.'s degree in Economics Science from *Department of Economics of the Santa Ursula University (Economia/USU)*.

Since october 2011 I am Adjunct Professor in the *Department of Economics and Finance at the Faculty of Economics of the Federal University of Juiz de Fora (FE/UFJF)*, where I am responsible for the undergraduate courses of *Microeconomics II* and *Asset Pricing, Derivatives and Risk*. I I also work in the *Graduate Program in Economics (PPGE/UFJF)*, where from 2015 on I am responsible for the course *Asset Pricing* (from 2012 to 2014 I was responsible for the course *Introduction of Mathematical Analysis for Economic Theory*).

Contact info:

UFJF Global July 2017: http://www.ufjf.br/globaljuly/
Course website: *pccoimbra.weebly.com/black-scholes_wc-2017.html*
e-mail to paulo.coimbra@ufjf.edu.br

External links:

- The Sveriges Riskbank Prize in Economic Sciences in memory of Alfred Nobel 1997.
- Black-Scholes-Merton: a 40-year revolution in finance.

Khan Academy:

- Introduction to the Black-Scholes formula.
- Implied volatility.