

MAD 5932-01, fall 2006**Teacher**

Raul Tempone (rtempone at scs fsu edu)

[OFFICE HOURS:] Tuesday, Thursday, from 10:00 to 11:00 hrs at Dirac 442.

Additional office hours may assigned by appointment.

[Course Syllabus](#)

Course material

- [lecture notes](#)

- notes on variance reduction,

- a Fourier wavelet method for SPDE,

Lecture and Homework Schedule

Tue. and Thurs. from 11.00am to 12.15 hrs, in LOV 0200 (the classroom may be changed later to access SCS computer facilities).

Starts on Tuesday August 29 2006.

Exercises and presentations: On Thurs. from 11.00am to 12.15 hrs.

The course focus on the following *real-world problems* and mathematical and numerical methods to solve them. In each application we study relevant mathematical and numerical methods to solve the problem. This includes methods and theory for ordinary, partial and stochastic differential equations, and optimal control, treating e.g. weak and strong approximation, adaptive numerical methods, the finite element method, Monte Carlo methods.

[Class by class schedule:](#)

Week	Problem	Subject
1,2,3	Population growth with noise stocks with noise	Stochastic DE, Ito-calculus, Euler-Maruyama method, Weak and strong convergence
4,5,6,7	Option price American options	The Feynman-Kac formula, Monte-Carlo Methods, variance reduction, finite difference and finite element methods.
8,9,10	Optimal hedging	Calculus of Variations, Optimal Control Dynamical programming, Hamilton-Jacobi equations
11,12,13	Implied volatility reaction rates	Optimal control
14,15	geophysical flow, turbulent diffusion Ground water flow material science	Convection-diffusion equations, wavelets correlated noise

Homework, Computer Laboratories , Presentations and Examination

The Examination consists of three parts: Homework problems, oral presentations and a written exam. The homework problems will be available here. The homework and the presentations are carried out by *groups of students*. Each group hand in a report on each assignment.

[Homework 1 \(pdf\)](#) on Ito integrals, due week 2.

[Homework 2 \(pdf\)](#) Implicit Euler for Ito SDEs, deterministic vs. stochastic models, due week 3.

[Homework 3 \(pdf\)](#) on Ito and Stratonovich, due week 4.

[Homework 4 \(pdf\)](#) on Feynman-Kac and Options, due week 5.

[Homework 5 \(pdf\)](#) on Monte Carlo for Options, due week 7 (Tuesday).

Handout materials for the lectures

An [introductory article](#) on numerical simulation of SDE:s by Desmond J. Higham. (Available from the FSU-domain).
The source files for the examples in the article are available [here](#).

Additional [sources](#) from Jesper Carlsson's page.
Example matlab code for [example 5.13](#) used in exercise session Tuesday week 9.

Exam Paper

A substantial part of the exam will be based on a list of questions given
[for 2006 here](#)

Exam

The exam will be held on Dec 12, 2006.