ORIE 5582: Monte Carlo Methods in Financial Engineering

This course covers the principles of derivative pricing, generation of sample paths and computation of payoffs, variance reduction techniques, sensitivity analysis, and American option pricing. While the course focuses on financial engineering, the general techniques are much more broadly applicable. The presentation is at a higher level than ORIE 5581, but at a lower level than the Ph.D. course ORIE 6580.

| Class time, location | Tues Thurs 1.25pm-2.40pm, Hollister 110  
First class on March 16, 2010 |
|----------------------|-----------------------------------------------------------------------------------|
| Recitation           | Fri 9:05am - 11am, Rhodes 471.  
First class on March 19, 2009 |
| Prerequisites        | ORIE 5581 (Monte Carlo Simulation)  
ORIE 5600 (Stochastic calculus) |
| Instructor           | Peter Frazier, 232 Rhodes, pf98 |
| TA                   | Rolf Waeber, 287 Rhodes, rw339 |
| Office Hours         | Monday 3:30-4:30pm (Frazier, 232 Rhodes)  
Tuesday 3-4pm (Frazier, 232 Rhodes)  
Thursday 4-6pm (Waeber, 287 Rhodes)  
[Check Blackboard for any schedule changes] |

The course website can be reached through http://blackboard.cornell.edu/. Please register with the course website as soon as possible and check it regularly.

There is no required text, but the following books may prove helpful.


Your grade will be based on homework (50%, equally weighted, dropping lowest score if all homeworks are conscientiously attempted), and an exam (50%).

You may do the homework in pairs or individually. If working in pairs, then hand in one homework with both your names on it. If there is a dispute about grading, you may turn in the entire assignment for a regrade within a week of the work being returned. All of the work, and not just the disputed question, will be regraded.

Homeworks will be due Friday morning, either handed to the TA at the beginning of recitation, or in the ORIE 5582 dropbox before 8:45am, so that he can pick them up before recitation.

The final exam will be on Friday May 21 2-4:30pm. It will be open-note, but closed-computer. *You must get a certain minimum grade in the final exam to pass this course. That grade depends on how hard the final exam is, but is usually around 50%.*
You will need to write short **computer programs** for homework assignments. You are strongly encouraged to write these assignments in C++. While assignments may be written in other languages, programming help will only be offered to those using C++. At the beginning of the class, students using C++ will be expected to have a basic knowledge of the language.

A small C++ library will be provided on Blackboard for generating random numbers from various distributions. Visual Studio Express Edition 2008 is installed on the lab machines in Rhodes 471, and is also available for free download from Microsoft at [http://www.microsoft.com/express/vc/#webInstall](http://www.microsoft.com/express/vc/#webInstall). Other C++ compilers may also be used (e.g., the GNU g++ compiler on Mac and Linux).

Although C++ can be more difficult to learn than some other languages, it is the primary programming language used in the financial industry. A majority of advertisements for jobs in quantitative finance explicitly require a familiarity with either C or C++, and using C++ in 5582 will provide some of this familiarity. A number of good introductory tutorials on C++ may be found on the web, and there are also many good books available. A selection of tutorials includes:

- [http://www.intap.net/~drw/cpp/](http://www.intap.net/~drw/cpp/)

**Attendance** at both the lectures and recitations is expected but not required. You are responsible for being aware of the announcements and content.

Each student in this course is expected to abide by the Cornell University **Code of Academic Integrity**. Any work submitted by a student in this course for academic credit should be the student’s own work, with exceptions/particulars described below. With the exception of your homework partner, if any:

- You may discuss the homework problems with other students, but only at the level of a discussion in a corridor. No notes should be taken away from such discussions.
- You may not work through the solutions with others, and you cannot share computer files.
- You may not discuss the homework with past students who have significant knowledge of the details of the problem set.
- You are not allowed to derive advantage in any way from the existence of solutions prepared in prior years, whether they are instructor-supplied or a student’s own work.

If you violate this policy then you risk failing the course.

If you have any questions about this policy, *please* do not hesitate to contact me.

[Syllabus updated March 16]