Text:
There is no assigned textbook, mainly because I haven’t found one I’m completely happy with. Some books you may find useful are:

1. *Options, Futures, and Other Derivatives*, by John Hull. We use this in FINN6210 and some of the later chapters are relevant for what we’ll cover in this course.

2. *An Introduction to the Mathematics of Financial Derivatives*, by Salih Neftci

Course Description and Objectives:
The course will cover multi-factor derivative pricing models. We will first review the basic theoretical background, including the discrete-time and discrete-state model, Ito processes and some relevant topics from stochastic calculus, and Risk Neutral Valuation. We will then review the Black-Scholes model. From there we will study commodity pricing models, including the popular 2-factor Gaussian models and then move to stochastic volatility models and their generalizations. We will show that these stochastic volatility models give “quasi” closed-form solutions for futures and options prices. We will also discuss multi-period discrete-time models (GARCH models) and how they differ from continuous time models. Time permitting, in the latter part of the course we may discuss interest rate models, focusing on the multi-factor affine models that are quite popular among practitioners. These include the multi-factor versions of the Vasicek and CIR (Cox, Ingersoll, and Ross) models.

Prerequisites:
I will assume students have a good understanding of options and derivatives at the level of FINN 6210. Although we will briefly review some topics from stochastic calculus, students will need to have a good basic understanding of MATH 6203. Also, students should have some programming experience and be able to do things like simple Monte Carlo simulations and optimizing functions over several variables. I will not require a specific programming language, however I probably will not be able to provide any programming help for anything other than Matlab.

Statement on Academic Integrity:
All students are required to read and abide by the Code of Student Academic Integrity. Violations of the Code of Student Academic Integrity, including plagiarism, will result in disciplinary action as provided in the Code. Definitions and examples of plagiarism are set forth in the Code. The Code is available from the Dean of Students Office or online at: [http://www.legal.uncc.edu/policies/ps-105.html](http://www.legal.uncc.edu/policies/ps-105.html)
Statement on Diversity:
The Belk College of Business strives to create an inclusive academic climate in which the dignity of all individuals is respected and maintained. Therefore, we celebrate diversity that includes, but is not limited to ability/disability, age, culture, ethnicity, gender, language, race, religion, sexual orientation, and socio-economic status.

Exams and Assignments:
There will be several graded assignments, a midterm exam, and a final exam. The grade breakdown is as follows: the assignments together will count for 40% and the midterm and final exams will each count for 30% of your grade.

Because there is no course textbook, you will occasionally be assigned papers to read to help fill in the details. I will expect you to read the assigned paper(s) before class.

Tentative Order of Topics Covered:
- Brief overview of course
- Review and Background
  - discrete-time and discrete-states models
    - binomial model
  - stochastic calculus
    - Weiner processes
    - Ito processes and Ito’s lemma
    - Stochastic integration
  - Single factor option pricing models
    - log-normal call property
  - Risk-neutral valuation
    - Girsanov’s Thm
    - Pricing kernel
- Multi-factor option pricing models
  - Gaussian models
    - futures pricing
    - options pricing
    - estimation
  - Stochastic volatility models
    - Fourier transform
    - Monte Carlo simulation
    - estimation using FFT
  - General affine models
  - Spread options
- GARCH models used for option pricing
- Interest rate models (time permitting)
  - basic ideas
  - 1-factor models: Vasicek, CIR, general 1-factor affine model
  - multi-factor models: 2- and 3-factor affine models